

THE JOURNAL
OF THE
Agricultural and Horticultural Society
OF
INDIA.

More Notes on the "Introduction of the Silkworm into the Punjab :" By HENRY COPE, ESQ.

TO THE SECRETARY AGRI-HORTICULTURAL SOCIETY OF INDIA.

SIR,—So far back as the year 1858, your Society did me the honor to publish a few remarks on "The Introduction of the Silk worm into the Punjab." In that communication I did my best to prove that it was, not only, possible to rear that precious insect in this Province, but that it might be done with advantage and profit to those who might be inclined to engage in the pursuit of an undertaking, calculated to promote their own interests, as well as to introduce a new and important branch of industry into this part of India, the more especially as the local manufacture of silk goods was large, and the demand for the raw material very considerable.

There seemed, as has already been stated on various occasions, but one doubt in the minds of those who were inclined to my opinion, on the question of rearing silk worms in the plains. It was conceded there would be no difficulty in introducing silk cultivation into the sub-montane portions of the Province, but there was a linger-

Bombay Presidency, and did not succeed merely because he could not concentrate a sufficiency of food, on any given spot, found that in the Dekkan they would bear a heat of 83° , but not more, 75° being the degree of temperature under the influence of which they thrive to the best advantage. In a rearing house properly constructed, I entertain no doubt that the temperature could be kept to that point, or even lower, up to the middle of April, when all operations, with acclimated eggs, could cease; with the bulk days before.

As the number of cocoons obtained was, of course, very considerable, I made an attempt to secure the services of one or two Bengalee reelers, but it was unsuccessful, and I was under the necessity of sending a large proportion of my produce to Bengal to be reeled. It did not improve by the voyage, and by exposure to the rainy season, but still Mr. C. S. Turnbull, Chief Manager of Messrs. Watson and Co.'s Filature, at Ghotal, to whom I have to express my thanks for this and other favors, was able to reel some skeins of silk that were greatly admired by the members of your Society, as may be seen by reference to a report of the monthly proceedings, and again valued above Bengal silk. Reeled fresh, on the spot, by an approved artisan, I am quite sure the result would have been still more satisfactory. The cocoons not reeled were disposed of in bulk.

Eleven of the skeins reeled by Mr. Turnbull, were submitted, by His Excellency's express desire, to the Right Honorable the Viceroy and Governor General, who, passing through the Punjab at the time my experiment was in progress, did me the honor to summon me to a private audience at Lahore, during which His Lordship expressed much interest in this undertaking, as on other matters, and desired ~~me to~~ communicate its progress and issue to him direct. He has been pleased to order the transmission of the skeins, submitted for his Excellency's inspection, to England, for examination and report. When favored with the result

I will do myself the pleasure to communicate it to the Society.

I need hardly say that the flattering and favorable direct notice taken of my endeavours, in this direction, by Her Majesty's representative in India, materially stimulated my endeavours, and I here take the opportunity of publicly acknowledging, with thankfulness, the grant to me, by His Excellency in Council, on the recommendation of His Honor the Lieut. Governor of the Punjab, of one hundred acres of valuable land, in the immediate vicinity of Umritsur, rent free in perpetuity, "in consideration of my exertions towards the development of the agricultural resources of the Punjab." His Excellency was pleased to observe on the occasion of this grant, that "Mr. Cope's active and judicious exertions to increase and improve the staple products of the Punjab, have, for sometime past, been observed by the Governor General in Council, who is of opinion that the grant proposed by the Lieut. Governor will be well bestowed. His Excellency in Council, therefore, gladly accedes to the proposal of the Punjab Government." I have, also, to express, as publicly, my thanks to Mr. McLeod, Financial Commissioner, for the manner in which he was so good as to bring my small services forward in his last annual report, and for the uniform support he has afforded to any suggestions I have, from time to time, made in regard to commercial or agricultural matters affecting this Province.

Being much occupied in the early part of the present year and having then no available room, for larger operations, I reared only a small number of worms as compared with the experiment of last year; my manager had gone to Kashmeer, and I had to put up with a dissipated Bengalee who neglected his charge greatly, and I had very little time to attend to it. Notwithstanding all these disadvantages I obtained a considerable quantity of very fair cocoons. I employed Jaffer Alee, of Dhareea,

to reel them after his coarse fashion, and soon found ready purchasers for the produce in the Umritsur market, @ 14, 8. per seer, which was, at the time, a better price, by 2 Rs. than that obtained, for the Bokhara silk, in the same market.

As there is, now, a large increase in the cultivation of the mulberry in the Government Garden, I propose, should my life be spared so long, to try an experiment during the season of 1862, with the view of ascertaining, practically, which kind of leaf is best suited to the worm in this country. There are now *four* distinct species of which three are available for use on a considerable scale, while of the fourth I can obtain a sufficiency for my purpose.

First—the common standard mulberry tree, apparently indigenous to the country, probably the *Morus nigra*, of which, unfortunately, the great majority is fruit-bearing, and that in such masses, just at the time when the leaves would be required in the largest quantity that the removal of the unripe fruit, from amongst the leaves, occupies much time and entails much trouble. The male plant of this species is, however, unobjectionable in this respect, but does not propagate, with any thing like facility, from cuttings, while it would take two or three years, with a considerable waste of land, to ascertain whether seedlings are male or female. On this account alone, the more extensive propagation of this species, for the purposes of silk worm feeding, is not desirable. The only use to which it could be applied, as it is so abundant here, would be to furnish young leaves when they first bud, for the young 'worms, and so economize, in a small way, the supply of the more suitable kinds. I made, in 1860, about 1,800 cuttings from a promising male tree: of this number, not more than $1\frac{1}{2}$ per cent took root, but those that did certainly have shot up most vigorously, are covered with strong healthy leaves, and will afford ample food, next season, to the extent required for an experiment of the kind I propose.

Secondly.—The Shah Toot (royal mulberry) with long white sweet fruit, introduced, it is said, from Kashmeer into many gardens about here, grafted on the indigenous stock, and so much prized, on account of its really pleasant fruit, that I dare say it would be difficult to induce the proprietors to part with the leaves, as they say the stripping them off would injure the tree. Otherwise they appear to me well suited for feeding worms. I have not yet met with a male plant, and suppose it would be difficult to find one, as, of course, only fruit-bearing grafts are used; but should I be successful I will use my endeavours to propagate some plants from cuttings, well assured that they could be turned to material use.

Thirdly.—The Philippine Island Mulberry known as the *Morus multicaulis*, than which, in the matter of propagation, it would probably be difficult to find a more prolific plant within the range of any cultivation. It has been described, but not quite accurately, by Colonel Sykes, as may be seen by a reference to vol. 8 (page 340) of the Transactions of your Society, the Colonel having, I suspect, confused the leaves of the Chinese species, with those of the one he so strongly, and so justly, recommends. Cuttings of this species were first obtained from Saharanpoor sometime in 1853 by the Agri-Horticultural of the Punjab, and I was then greatly struck with their wonderful growth. It has since been cultivated in that Society's garden, though not to any great extent, and when the Umritsur garden was formed I obtained a small supply from that quarter. From Saharanpoor itself I received an addition to my stock. From these, and reproductions in the Umritsur Garden, I have now secured plants enough to afford cuttings, with those of the next species, to plant from sixty to seventy acres of land in the commencement of 1862. The growth is sometimes astonishing. Cuttings, put down in *February*, 1861, have shot up into plants, now (October) all more than six

feet high, while many are eight, nine and ten, and some as high as twelve, feet, covered, from top to bottom of their numerous wide-spreading stems, with fine healthy leaves; while, such is the power of reproduction of this species, that I am within bounds, when I assert that 95 per cent of cuttings, put down in February, will thrive, if treated with the most ordinary care and watered to a reasonable extent. The more it is cut the greater number of stems, and, as a matter of course, of leaves does it produce. Its roots strike deeply, and if on taking up any plant, parts of the root are left in the ground, any where near the surface, they throw up new stems in a very short time.

Fourthly.—The Chinese Mulberry or '*Morus Sinensis*', a very strongly marked species, supplies of which were obtained, from Lahore and Saharanpoor, at the same time as the former, and of which Mr. Fortune speaks very highly as affording the best silk produced in China. It is propagated with equal facility with the *Morus multicaulis*, but though the leaves are very much larger (some full twelve inches from the stalk to the apex and nine inches broad) I do not think the crop, in weight of leaves, of an average number of plants of each kind, of the same age, would be found so great. The stems are not so numerous, but they are individually much thicker, and could, when not required for further propagation in the shape of cuttings, afford ample supplies of wood for the use of the filature. The plants are, on the whole, taller than those of the *Morus multicaulis*. My present impression is that the latter will be found best suited for cultivation and for feeding the worms. My experiment, if carried out, will assist in showing how far my surmise is correct.

In my previous communication, on this subject, I alluded to the facilities afforded in the district of Thanesur for the planting of Mulberry shrubs along the banks of the western Jumna Canal. I have some reason to believe, from correspondence that has recently taken place, that my sugges-

tion will not have been thrown away, and that plantations will be made in that quarter, supplies of cuttings being obtained from Saharanpoor. Sometime in 1859 or 60, I forget which, I urged the subject on Major Drummond, then officiating Director of Canals in the Punjab. I was assured it should not be lost sight of, Major Gulliver, Superintendent of the Baree Doab Canal, expressing his anxiety to carry out my views. I am happy to say that a good commencement has actually been made by Capt. Fulton, in his division of the canal. His plantings at Mujoopoor, about 9 miles from Umritsur, began rather late (September) this year; but it is satisfactory to hear that, even under this disadvantage 75 per cent of 29,000 cuttings supplied by me, are reported to be doing well. Capt. Dyas, the Director of canals, is in favor of this cultivation, and if extended, as I hope it will be, in the early part of 1862, very large quantities of leaves will be available along portions of the Baree Doab canal in 1863, and worms might be reared along its banks.

His Highness the Raja of Kuporthulla has taken an interest in this branch of agriculture with the view of improving his large estates in the Julundhur Doab, and plantations, from cuttings I supplied, have been commenced near his Capital.

Enquiries have been made of me from Simla as to the eligibility of one large estate, about 4000 feet above the level of the sea, for mulberry planting and I have expressed my belief that it is well suited to the purpose.

Leiut. Pogson has signified to you his intention of devoting his attention to the subject of Silk worm rearing on his estate near Simla where he is forming a Mulberry plantation, and I have reason to believe that an officer at Naoshera will undertake silk rearing during the coming season.

Jaffer Alee, who never stirs abroad, without the medal bestowed on him by your Society, has earned some money,

during the last two years, from his small factory, and is anxious to enlarge his plantation, whenever opportunity may offer, but land is obtainable with much difficulty in that direction. I hear that several people about Soojanpoor and Pathan Kote are stirring in the matter, while plantations, along the canal in that quarter, would probably decide them. Kureem Khan, of Tiloknath, has been employed, besides carrying on his own small filature, by a planter in the Kangra Valley. The better kinds of mulberry shrubs have been planted at Dhurmsala by Mr. Reginald Saunders, and are said to be thriving, while, as I have already informed you, some of the Tea-planters in the Valley of Kangra have expressed their full determination to graft silk cultivation on their more immediate pursuit. One has planted the mulberry largely, another has applied to me for cuttings, and the Overseer of the Government Tea plantation, at Holta, who had a quantity of the Philippine Island and Chinese mulberry plants at his disposal, actually reared silk worms this year, and though the cocoons were not first-rate, they were fair for a first attempt. A portion of them, about 28 seers, is being wound at Umritsur, and the silk will be sold in our market.

Altogether the progress made, within the present year especially, is encouraging. Once an ample stock of *leaves* secured for the worm, there will be nothing whatever to stand in the way of the silkworm being reared in this and other parts of the province, while filatures and silk will, in due course, follow the "Introduction of the silk worm into the Punjab," now, I hope, only a work of time.

We in the Punjab, who are likely to reap the advantage of this foresight, have great reason to be thankful to Dr. Wm. Jameson, Superintendent of the Saharunpoor Botanical and other gardens in the N. W. Provinces, for the introduction and cultivation of the two shrubs likely to be so useful to us, should our plans be carried out, and for the

liberal manner in which cuttings have been distributed to all who applied for them. I may mention also as another encouraging fact that Dr. Jameson had opportunities, (having succeeded him as Civil Surgeon to the political agency) of judging of Dr. Gordon's experiment at Umballah some years ago, and expressed to me, in the early part of this year, his firm belief that had Dr. Gordon not been removed from that station, his endeavours to cultivate the silk worm at Umballah, a much less favorable situation certainly than Umritsur, would have eventuated in complete success. I had no knowledge of Dr. Gordon's operations, (which I recently learnt extended over three years) when I first thought that Silk might be furnished on the spot to the numerous looms at Lahore and Umritsur, and I look forward with confidence to the full realization of my expectations within the next two or three years.

Believe me,

UMRITSUR :
21st October, 1861.

Yours faithfully,
HENRY COPE.

Report on samples of Cotton from Rangoon and Etawah.

To the MEMBERS OF THE COTTON COMMITTEE.

GENTLEMEN,—I beg to submit, for the favour of your opinion, the following samples of cotton, viz :—

Nos. 1 to 6 samples of cotton raised at Rangoon from foreign seed, with a report from Dr. Brandis.

Nos. 1 and 2 raised at Etawah from native seed, with letter from Mr. S. Bird of Allahabad.

CALCUTTA :
25th Sept., 1861.

A. H. BLECHYNDEN,
Sec. A. and H. S.

To the SECRETARY OF THE AGRI-HORTICULTURAL SOCIETY.

For. Dept. **SIR,**—I am directed by the Governor General in Council to forward to you, the accompanying copy No. 88, of 14th May. of a letter from the Commissioner of Pegu and of its enclosure from Dr. Brandis, reporting upon the experimental cotton cultivation in Pegu during 1860-61, together with the samples of cotton therein referred to, and to request the favor of your submitting a report therein.

C. U. AITCHISON,

PORT WILLIAM : *Under-Secy. to the Govt. of India.*
The 3rd June, 1861.

To the SECRETARY TO THE GOVERNMENT OF INDIA.

Foreign Department, Fort William.

Sir,—I have the honor to submit for the information of Revenue. His Excellency the Governor General in Council, copy of letter to my address No. 222, dated 13th instant, from Dr. Brandis, Superintendent of Forests reporting upon experimental cotton cultivation in Pegu during 1860-61.

2. Samples of the various descriptions of cotton raised are forwarded by the same steamer which conveys this letter, and a list of the samples is attached to Dr. Brandis's letter.

3. I trust His Excellency the Governor General in Council will be pleased to allow Dr. Brandis's letter and the samples of cotton to be sent to the Agricultural Society, Calcutta.

I have the honor to be &c.

(Signed,) A. P. PHAYRE,

PEGU COMM'R'S OFFICE

RANGOON :

The 14th May, 1861.

*Commr. of Pegu and Agent
 to the Govr. General.*

To Colonel A. P. PHAYRE,

Commissioner of Pegu and Agent to the
Governor General, Rangoon.

SIR,—I have the honor to report to you on the results of the experimental cotton cultivation by the Forest Department in Pegu, during 1860-61.

2. Rangoon. The experiments in the seed of the following kinds have utterly failed.

Brazilian,	}	Sown May and June, 1859.
Egyptian,		
Upland Georgia, ..		
Egyptian, from seed raised at	}	Sown May and June, 1859.
Rangoon,		
Sea Island,		
Petti gulf,		

Texas seed sown in August 1859, has yielded a very scanty harvest of good cotton.

The expenses of the Rangoon garden have amounted to.

Contingent expenses,	147	8	0
Pay of Gardener,	112	8	0

Rs. 260 0 0

3. Myodwin, Tharawaddy district. Several kinds of cotton were cultivated at this place.

About 4 acres were prepared and fenced in at Myodwin, Sea Island, Upland and New Orleans seed was sown in it, but all failed with the exception of a small number of Sea Island plants which yielded about 10lbs. of cotton.

The soil was a stiff clay and proved utterly unsuitable for the plants, which after suffering much from the effects of the late and heavy rains in November withered away immediately after the close of the rains. Burmese cotton had been cultivated on the same soil with good success.

New Orleans Cotton sown at the village Nyounglebur near Myodwin on a piece of ground measuring $4\frac{4}{5}$ acre.

Soil—a light sand formerly (before the course of a neighbouring stream had been cleared) frequently exposed to inundations. The land was covered with elephant grass which was cleared away.

The plants which had been sown in July succeeded admirably and yielded 100lbs. of cotton which corresponds to a yield of 125lbs. per acre, the quality of the cotton was good.

The expenses of the cotton cultivation at Myodwin have been as follows.

<i>Contingencies</i> ; hire of labourers, fencing,					
tools &c.	..	..	..	..	562 10 5

The total expenditure on experimental cotton cultivation during the year has been,

Contingencies,	..	...	..	..	710 2 5
Establishment,	..	..	..	..	112 8 0

Total Rs. 822 10 5

4. The experience here recorded renders it advisable to abandon the cultivation of foreign cotton at Rangoon and to concentrate all efforts upon the experiments made on the sandy alluvial soil at Nyounghein, near Myodwin, or in localities similarly located.

5. With this report, I beg to submit samples of the cotton reaped as per list annexed, and would suggest their being sent with a copy of this report to the Secretary Agricultural and Horticultural Society, Calcutta.

I have &c.,

(Signed,) D. BRANDIS,

SUPDT. OF FORESTS OFFICE,

Supdt. of Forests P. T.

RANGOON:

and M. Provinces.

13th. May, 1861.

List of samples of cotton sent with the report on the experimental cotton cultivation in Pegu, for 1860-61.

1. Texas (with seed) Rangoon 1860 about 1lb.

2. New Orleans (without seed) Nyonglebin 1860 first quality about 50lbs.

3. New Orleans (without seed) second quality Nyonglebin 1860 about 3lbs.

4. New Orleans (with seed) Nyonglebin 1860 about 4lbs.

5. Sea Island (without seed) Myodwin 1860 about 3lbs.

6. Ditto ditto, (with seed) Myodwin 1860 about 1lb.

(Signed,) D. BRANDIS,

SUPDT. OF FORESTS OFFICE,

*Supdt. of Forests P. T
and M. Provinces.*

RANGOON :

The 18th May, 1861.

A. H. BLECHYNDEN, Esq.

Secy. to the A. and H. Society of India, Calcutta.

DEAR SIR,—I have sent by the Steamer *Agra* to your address two small samples of cotton of native growth from the Etawah district and shall be much obliged if you will give me your opinion of it. It is my intention to plant as an experiment about ten acres next season, if I can procure good seed, and I shall esteem it a favour if you will let me have what you can spare from the Society's stock.

I see that there has been a reprint from the Society's Journal of directions for cultivating cotton, and I should like much to have a copy of this, or of any other practical papers upon the subject, the expense of which I shall be happy to remit you.

ALLAHABAD :

Aug. 2nd, 1861

S. BIRD.

A. H. BLECHYNDEN, Esq.,

Secy. A. and H. Society of India.

SIR,—I beg to hand you a report on the six samples of cotton grown from foreign seed in the experimental cotton cultivation in Pegu under the superintendence of Dr. Bran-

dis, in 1860-61, and submitted to the Agricultural Society by the Government of India.

No. 1. Texas with seed. This is not a desirable kind of cotton, being coarse, harsh and weak in fibre, and of a greyish color, the staple is however of fair length. It is impossible to give a market value to cotton before it is separated from the seed, as the operation of ginning will materially affect the length of the staple in some descriptions, but this may be worth $5\frac{1}{2}d.$ φ $15.$ when cleaned, (in the English market.)

2. New Orleans, cleaned. This is a much more useful description of cotton than the preceding, but the condition of the samples is bad and it is rather short in staple and weak in fibre and the color also is not good being greyish, value $6 @ 6\frac{1}{2}d.$ φ $15.$ in England.

No. 3. Do. do. 2nd quality. This cotton is of the same description as the preceding but is inferior to it in every respect, and the condition is even worse, being much stained, the value is consequently impaired and very doubtful.

4. Do. do. with seed. This is a very suitable description of cotton, the staple is rather short but the fibre is of fair strength, value when cleaned probably $6\frac{1}{2} @ 7d.$ in England.

5. Sea Island. The high character of the stock is maintained by the sample, being of a soft and silky fibre and good strength and fair length of staple, but it is in very bad condition being stained and much of it tender, the value is therefore much impaired; if in good condition it might be worth $14d.$ φ $15.$ and in its present condition only about $8 @ 10d.$ in England.

6 Sea Island in the seed. This is apparently the same cotton as the preceding only with seed, and the same remarks will apply to both.

SR. DOUGLAS.

CALCUTTA

28th September, 1861.

Report on two samples of cotton raised at Etawah from native seed by Mr. S. BIRD of Allahabad.

This is a poor sample of native cotton, the color and condition are good but as usual with this description the staple is extremely short and the fibre has little or no strength, the want of these essential qualities, viz. length of staple and strength of fibre, makes this cotton take a very low rank, indeed the cultivation of such qualities should not be encouraged, but rather the reverse, and while good seed is procurable, the same expense and attention bestowed on the cultivation of these better kinds would produce a much better result for the grower, and a much more useful cotton than that now under view. No. 2 is superior in every respect to No. 1.; the value of No. 2 in England is about 4½d. per lb.

ST. DOUGLAS.

28th Sept., 1861.

No. 1. *Texas cotton with seed.* Staple good—color bad.

No. 2. *From New Orleans seed.* Staple rather short—badly cleaned.

No. 3. *Ditto. 'ditto.* Staple short—color bad.

No. 4. *Ditto. ditto with seed.* Staple long—color good.

No. 5. *From Sea Island seed.* Staple good—color indifferent

No. 6. *Ditto. ditto with seed.* Staple good—color bad.

No. 1. *Etawah cotton from native seed.* Staple short—color not good—badly cleaned.

No. 2. *Ditto. ditto.* Staple short—color better than No. one.

C. A. CANTOR.

Correspondence relative to the extent of Date tree Cultivation in Jessore.

*To the COMMISSIONER of the
Nuddea Division.*

Jessore, Dated 21st September, 1858.

SIR,—With respect to your letter No 216 of the 25th April last and in continuation of my letter No. 114 dated the 5th June giving the return of number of acres under Indigo cultivation I have the honor to forward you the accompanying statement showing as near as possible the extent in acres under date or sugar cultivation.

2. In preparing this Return immense difficulty has been experienced from the nature of the Village date cultivation in this Country, which does not consist, excepting in a few Villages, of regular plantations, but the trees are planted here and there quite devoid of all uniformity or plan. The date cultivation has increased greatly within the last few years, since the Ryots have discovered that it yields as certain, if not a more certain return than any other crops.

3 The accompanying return has been prepared thus.—The actual number of trees has been ascertained in 36 Villages in different parts of the district, exclusive of the sub-Division of Magoorah; within these 36 Villages there are 1,57,837 trees giving an average to each Village of 4,384 trees. Allowing therefore for each tree 2 Gundas of land there are 200 trees for each Beegah or 21 Beegahs of date cultivation for each Village. Within the Sudder Division and the two sub-Divisions of Khoolneah and Goopalgunge there are 2764 Villages, which multiplied by 4,384 gives, 12117376 trees which allowing 200 trees for each beegah makes 605-260½ Beegahs under cultivation.

4. Mr. Skinner at Magoorah in his return gives only 1,000 trees to 10 Beegahs; this is certainly, I think far

under the mark though they do not abound so much in his sub-Division as in many other parts of the district. There being therefore 1,116 Villages in his sub-Division, the number of trees will be 1116000 or 11160 Beegahs making a total over the whole District of 13233376 trees or 71746 Beegahs which being converted into acres gives 23750-3-0.

The above I look on as far below the mark but it has been ascertained as nearly as possible. This is exclusive of private cultivation at a large sugar Factory which exists at Chowgatcha about 15 miles from the station, the return of which may be concluded as an accurate measurement of the large plantation of date trees, which spread far and wide around the Factory, and which their proprietor states to cover 2,307, Beegahs or 763 acres making a grand total of 24573 acres under date cultivation.

C. The probable value of produce is reckoned at 30 Rs. which gives 21,55,380 rupees for the 71,846 beegahs or £ 2,15,538 for 24,472 acres.

I have &c.

(Signed) F. C. FOWLE,
Collector.

P. S.—Copies of the Sub-Divisional reports of Magoorah and Khoolneah are herewith forwarded.

District	Quantity of Land under sugar cultivation in acres.	Value of produce in £.	Remarks
Jessore, ..	24513	£ 222,159	For particulars See report attached.
Jessore Collector- rate : The 21st Sept. 1858.	Corrections made in the Commrs. Office.		(Signed) F. C. Fowle <i>Collector.</i>

To The COLLECTOR, of Jessore.

SIR,—Relative to sugar I have the honor to furnish a statement of the quantity of sugar and Goor, sold at each hath and retained in the neighbourhood respectively (memo. A). Also particulars of some sugar Factories, as far as I have been able to ascertain (memo B). And lastly a statement of the whole produce and expenditure of the Division (memo C). Allowing for omissions and concealments, I would put down the total produce at 400000 and Local expenditure at 45000.

I have &c.

MAGOORAH :

(Signed)

C. B. SKINNER.

The 8th July, 1858.

Dy. Collector.

MEMO A.

No.	Names of Markets.	Amount of Goor Sold.	Amount of Sugar Sold.	Amount of Goor consum- ed privately.	Amount of Sugar Ditto.	Remarks.
<i>North West.</i>						
1	Solcoopa,	200	100	19	95	The private ex- penditure must be more than this. Nearly all this is Kooshooree. I know of no Sugar Factories in this direction. There is some Sugar Cane to the ex- treme North West.
2	Amalsha,	1,000	650	300	200	
3	Burzooly,	200	50	100	45	
4	Daryapore,	500	300	475	285	
5	Benipore,	100	25	95	23	
6	Guneshpore,	150	40	142	38	
7	Sreepore,	100	40	95	38	
8	Radhanaghur, ..	200	100	190	95	
9	Dowtya,	25	15	23	24	
10	Garakala,	80	10	76	90	
11	Najcerut,	12	6	11	5	
12	Muckerempore, ..	10	5	9	4	
13	Alfapore,	4	2	3	1	
14	Mosalya,	10	4	9	3	
15	Sarotya,	20	5	19	4	
16	Meezapore,	5	2	4	1	
17	Burodoha,	10	3	9	2	
	Total, ..	2,626	1,357	1,579	953	
<i>South and about Magoorah.</i>						
18	Magoorah,	400	250	65	10	The date Sugar is to the Cane Sugar in a rate of 100 : 5½ and Goor of 200 : 17.
19	Issacodda,	575	250	75	14	
20	Hazrapore,	12	1	3	„	
21	Ramnaghur,	25	1	6	„	
22	Burroi,	70	2	10	„	
23	Alookdiya,	75	2	5	„	
24	Jugdai,	120	1	23	„	
25	Jaglah,	90	2	21	„	
	Total, ..	1,367	509	208	24	
<i>South East & East</i>						
26	Bindapore,	20,300	10,300	120	55	Date Sugar is to the Cane Sugar : : 99 : 1 nearly and Goor 75 : 1.
27	Nushbanga with Raricolly,	2,000	20,000	200	100	
28	Mahomedpore, ..	720	1,200	110	50	
29	Nohattee,	2,000	50	50	20	
30	Kalligunge,	500	20	10	„	
31	Meergunge,	1,000	10	10	„	
32	Alfadanga,	3,200	800	20	10	
	Carried forward,	29,720	32,380	520	235	

No.	Names of Markets.	Amount of Goor Sold,	Amount of Sugar Sold.	Amount of Goor privately consumed.	Amount of Sugar Ditto.	Remarks.
	Brought forward,	29,720	32,380	520	235	
33	Baboo Colly, ..	400	60	13	10	In 206 Villages about 2,06,000 date trees.
31	Seergram, ..	720	120	10	8	
35	Hatbarea, ..	200	10	5	1	
36	Raygunge, ..	500	10	10	..	
	Total, ..	31,540	32,580	558	254	
	West, S. W. and N. W.	Date Goor Sold.				
37	Kalleegunge, ..	46,118				In this quarter—about $\frac{1}{2}$ of land are in paddy $\frac{1}{2}$ date. In 595 Villages about 600,000 date trees, 119261 mds. of Goor.
38	Nugger Chaprail,	14,000				
39	Mustabapore, ..	4,000				
40	Katlamaree, ..	8,000				
41	Boidangah, ..	3,000				In 24 Villages i. e., Jagy. & Sugar factories, 31,600 Sugar is prepared. In 595 Villages date Goor 11,9,231 In 12 Villages Kooshoree 3440 : In 9 Villages Khalya 10,280 :
42	Nuggurbathan,	4,000				
43	Jenidah,	10,000				
44	Bhattai,	4,000				
45	Gungooteea, ..	2,000				
46	Bakoora,	600				
47	Govindpore, ..	200				
48	Mudoopoore, ..	700				
49	Gopalpore, ..	4,000				
50	Nursing Gatti, ..	250				
51	Madarhatti, ..	200				
52	Kalli Chwmpore,	100				
53	Masthakaller, ..	100				
54	Kamalhat, ..	800				
55	Gowalkallee, ..	500				
56	Srugshookur-gunge,	400				
57	Noldangah, ..	100				
58	Bashdebpore, ..	50				
59	Porahatty, ..	800				
60	Phoolbarree, ..	100				
61	Joradah,	400				
62	Hurrinakoondoo,	60				
63	Sokharidoha, ..	100				
64	Sooolepore, ..	400				
65	Kabilpore, ..	50				
66	Aboipore, ..	50				
	Total, ..	105078	..	11,783	..	
	Kooshoreea Goor,	3,241	—	199	..	
	Khalea Goor, ..	1,155	—	125	..	
	In 24 Factories					
	Sugar, .. ..	..	24,555	..	7,045	
		109474	24,555	12,107	7,045	

MEMO. B.

Names of Villages.	Number of Factories.	Amount of Sugar manufactured.	Remarks.
Magoorah, ...	2	400	* There are others in this direction of which I have not particulars.
Isaacoda, ...	2	200	
Raricolly, ...	3 or 4	*	
Mustabepore, ...	22	10,000	
Baroipore, ...	19	8,000	
Farashpore, ...	1	200	
Nuggurbotham, ...	8	2,000	
Balerampore, ...	1	300	
Modhoopore, ...	1	500	
Fowcharree, ...	2	600	
Chapalee, ...	1	300	
Gopalpore, ...	2	700	
Surat Bagdangah, ...	8	1,600	
Kalleechurnpore, ...	1	200	
Hamdoah, ...	1	100	
Khafeerah, ...	4	800	
Mooraridohee, ...	4	800	
Juridah, ...	2	1,200	
Pobabatty, ...	1	200	
Lohajinga, ...	1	600	
Bhowanipore, ...	3	400	
Baidanga, ...	4	800	
Shaggannah, ...	3	100	
Bhatioreah, ...	5	1,000	
Chowra, ...	2	400	
Bhatpara, ...	1	200	

MEMO. C.

	Number of Markets.	Sugar Sold.	Sugar retained in the neigh- bourhood.	Goor Sold.	Goor retained in the neigh- bourhood.	Remarks.
In the North we have, ...	17	1,357	862	2,626	1,750	Date-trees cultivation appear to be rated at about 1,000 trees on 10 Beegahs of land to each Village throughout the Division.
South & about Magoorah,	8	509	204	1,567	208	
North East and East, ...	11	32,580	254	31,540	558	
West S. W. and N. W., ...	30	24,555	7,045	1,11,874	12,019	
Total, ...	66	59,001	8,365	14,7,607	14,535	
Equivalent in Goor accord- ing to Mr. Robinson @ 3 mds. Sugar to 1 md. Goor.	17,003	24,555	1,47,407	14,535	We have in the North 50,000 trees in 100 Beegahs. South 1,000 Ditto, 100 Ditto. N. E. 15,000 Ditto, 150 Ditto. S. W. N. W. & W. 600,000 in 6,000 Do. What proportion this may bear to other lands is difficult to tell but I fancy about 1 : 500.
Equivalent in Goor by my enquiry being 3½ mds. Goor to 1 md. Sugar, ...	...	2,06,504	23,648	1,47,407	14,535
	...					

(Signed,) C. B. SKINNER,
D. C.

To THE COLLECTOR OF JESSORE.

Khoolneah-Dated 16th August 1858.

SIR,—I have the honor to acknowledge the receipt of your letter No. 111 dated the 4th May last on the subject of the extent of the Date and Sugar cultivation in this district.

2nd. In reply I beg to state that in the absence of any reliable data upon which all statistical facts ought to be grounded, I am apprehensive that any information I may give you of the approximate extent of the date cultivation within this subdivision, will be meagre and unsatisfactory and quite unworthy of the importance attached to the matter by the Commissioner. A statement to be worthy of a place in a Blue book of the House of Commons must be based on accurate facts—facts undeniably connected with the subject of the statement and not on assumptions which may doubly mislead, first from a want of accuracy in the details of information and second from an original error in the assumption itself.

3rd. I do not perceive, supposing even that we can find what the extent of rice and other cultivation is, that any relation can be established between that and the extent of the date tree cultivation. In some parts of this Sub-Division the date grows luxuriant, in others meagrely, in some not at all; whilst everywhere, either in the *Beels* or lands reclaimed from the Jungle where the date is not to be found, or in the higher lands suited for it, one may always meet with fields suited for one or other sort of Paddy crop. Besides it must be observed that the date hardly interferes with the cultivation of other crops—except in particular places where the land, I have observed, being unsuited to the growth of other crops has thick clusters of the date, one will find the latter over-topping fields of rice, *Sursoo* or *Moosaree* or mixed up with the *Suparee*, the mangoe, or the Jack. It may therefore easily be concluded that any

information based on the relation of the extent of the date tree cultivation to that of other crops, independent of any accurate data as to the latter, will be fallacious.

4th. The only way of arriving at any fair estimate of the extent of the cultivation in question, that presents itself to me, is by making an estimate of the annual out turn of *Goor* in the division. The trees may be said to produce an approximately equal quantity of the raw extract, for trees are leased by the score and the average out turn of the *Goor* is always approximately proportional to the simple extract. An estimate of the annual out turn of *Goor* may be had from obtaining an account of the sales of *Goor* in the different *kats* of the district, for the first exchange that is made of it, by the grower or rather the manufacturer of the raw produce, for money, is in the Village *kat*. All home consumption and export of the raw produce may, as well as that which is manufactured into sugar, fairly be concluded to be included in these sales.

5th. The next way of arriving at some idea of the extent of the cultivation is by taking into account the quantity of raw produce or raw sugar brought up by the several native manufacturers in the division—very little, proportionately, of the raw produce is used for home consumption. The quantity of raw produce exported to Calcutta or other places alone will not enter into the calculation and be accounted for.

6th. The first information it is now difficult to obtain, the season of produce having long since passed away. I have ascertained too that the owners of *kats* keep no record of the quantity of produce which is annually sold in them, or of the Cesses, they realize on the sales—Cesses the amount of which could give some idea, though not accurate, of the sales, in as much as they are realized not so much, with special reference to the quantity of raw produce sold, but to the number of vessels filled with it

brought into the market. The season having passed away acts equally as a bar to the obtaining of any accurate information as to the quality of produce that has been brought up by the manufacturers. Considering that this information, even if it were obtained, would not be so much useful as it could be desired to be, with reference to the information that is wanted; and believing, from the Commissioner's observations in the 3rd para: of his letter, that the available information on that head had been given in by you, I was not very much solicitous to obtain it such as it might be. Any information obtained from the manufacturers would not be trust-worthy, for the very fact of a call from them of such information would fill them with anxiety as to the objects for which such a call is made and induce them to furnish untrust-worthy returns or none at all. Any information to be of any value ought I think to be collected during the next produce season.

I have &c.

KHOOLNEAH. (Signed,) ISSUR CHUNDER MITTRE,
SUB-DIVISION : Dy. Magistrate.

TO THE SECRETARY TO THE

Board of Revenue, L. P. Fort-William.

Dated Allipore, the 11th Octr. 1858.

SIR,—In continuation of my letter No. 54 Ct. dated 8th July last, I have the honor to submit copy of a Return shewing the approximate extent in acres and produce of date or sugar cultivation in the district of Jessore.

2nd. The Collector says that in preparing this Return "immense difficulty has been experienced from &c," (down to end of 2nd para.)

3rd. The data of calculation are as follow. The actual number of trees has been ascertained at 1,57,887 in 86 Villages in different parts of the district (exclusive of Magoo-

rah sub-Division) thus giving an average to each Village of 4384 trees allowing 200 trees to each Bigah there will be according to the above rate, 21 Bigahs of date cultivation in each Village. Now there are within the Sudder Division and the two Sub-Divisions of Khoolneah and Gopalgunge 2764 Villages which multiplied by 4384 (average No. of trees to each Village) gives 12,17,376 trees or (at the rate of 200 trees to each Bigah) 60,586 Bigahs of cultivation.

4th. Mr. Skinner of the Magoorah sub-Division gives only 100 trees to each Bigah, which rate the Collector says is far under the mark although date trees do not abound so much in this sub-Division as in other parts of the District. Now there are 1,116 Villages in the sub-Division which multiplied by say 10 Bigahs of cultivation to each Village gives a total of 11,160 Bigahs or (at 100 trees to each Bigah) 11,16,000 trees making a total over the whole District of 132,33,376 trees or 71,746 Bigahs which being converted into acres gives 23,750 Acres.

5th. Besides, the cultivation of the large Sugar Factory at Chowgatcha, 15 miles from the sudder station, must be taken into account. The proprietor of this Factory says that his plantation covers 2,307 Bigahs or 763 acres making a grand total of 24,513 acres of date cultivation in the whole District.

6th. The probable value of produce is reckoned at 30 Rs. per Beegah which multiplied by the total number of Beegahs (74,053) gives Rs. 22,21,590 as total value of produce or £ 2,22,159 for 24,513 acres.

7th. I beg to submit also Copies of three useful state-

A statement of the quantity of sugar and goor sold at each hât and retained in the neighbourhood respectively.

B Do. contg. particulars of sugar Factories as far as could be ascertained.

C Do shewing the whole pro-

ments as per margin prepared by Mr. Skinner of Magoorah.

8th. I think that Mr. Fowle is entitled to credit for the pains which he has taken to obtain this information which however

duce and expenditure of the sub- is far from perfect. I believe
Division. the sugar produce of the Dis-
trict to be of higher value than is here represented.

I have, &c.,

(Signed) A. GROTE,
Commissioner.

A. GROTE Esq.

DEAR SIR,—I am glad you have given me the opportunity, in your note of 11th inst. with its enclosure, of offering a few remarks on the Date Tree cultivation of Jessore, as it is a subject in which I have always felt much interest.

As Mr. Fowle truly remarks, any attempt to ascertain the actual area under cultivation, in any district or Pergunnah, must be surrounded with difficulties. It is only of late years that the trees have been planted with any regularity or system: formerly the custom was to plant them along the hedges or margins of rice or other fields, and around the ryot's houses and a large proportion is still found growing in such situations.

It appears to me that the only method of *approximately* ascertaining the area occupied would be to call for a return of the quantity of *goor* produced in a district in any average season: the average produce of goor from a given number of trees is pretty well ascertained, and may be fairly estimated at 15 Seers of 80 Sicca Wt. per tree [including yielding trees in all stages of growth from those partly grown to those in course of decadence],—and the number of trees being thus estimated the average space they would occupy, at a fair average number per Beegah, might be calculated therefrom.

My own experience gives the number of trees per Beegah of 14,400 sq. ft., when planted by the natives with any attempt at regularity at 160.

I see Mr. Fowle calculates at 200 per Beegah, but his figures require some explanation: he allows [para: 8] "for each tree two cottahs of land," but as there are only 20 cottahs in a Beegah this would give but 10 trees per Beegah in lieu of 200. He probably intended to allow "2 *chittacks*" per tree: this would give 160 trees per Beegah which agrees with my estimate.

His mode of estimating at 21 Beegahs as the average cultivation "per Village" can afford but very vague and unsatisfactory data for any practical purpose;—for there must be very many Villages in the Khoolna division where from the low situation no date trees could be grown at all.

Another advantage in calling for returns of the produce in *goor* would be the affording a comparison with the similar returns, which were collected by *Government* in 1848 at the instance of the Bengal Chamber of Commerce, and published by Government authority in that year;—and if the statistics of the sugar produced from cane were also again called for, as they were in that year, they would afford very interesting data for comparison of the two periods, and I think would shew a large decrease in cane, corresponding with the increase in date cultivation,—thus confirming the vastly superior economy of the latter.

I apprehend there would not be much difficulty in arriving at an estimate of the quantity of *goor* produced. Local enquiries from the manufacturers at all bazars and villages where it is brought and worked up into the superior kinds of sugar for export, would give the total so appropriated; and the local consumption might be estimated at so much per head over the population as it was in 1848: and the two together would afford a fair, though imperfect, estimate of the *arab*. Finally, I believe the season of the current year taken as a very fair average one for date produce.

CUTTACK:

I am &c.

27th, 1858.

S. H. ROBINSON.

Communication regarding Cotton cultivation in the Hyderabad Assigned Districts. Communicated by the Govt. of India.

TO THE SECY. TO THE AGRICULTURAL AND HORTICULTURAL SOCIETY.

Fort William, the 31st. October 1861.

Foreign Dept., General.

SIR,—IN continuation of my letter dated 30th March last, No. 1472,* I am directed by the Governor General in Council to forward, for the information of the Society, the accompanying copy of a further communication from the
No. 139, dated 10th Resident at Hyderabad, regarding the
October 1861. cultivation of Cotton in that Territory.

I have &c.

W. GREY.

For Under-Secretary to the Government of India.

From **LIEUTENANT-COLONEL CUTHBERT DAVIDSON, C. B.,**
Resident at Hyderabad,

To **LIEUTENANT-COLONEL H. M. DURAND, C. B.,**
Officiating Secretary to the Government of India, Foreign Department,—dated the 10th October 1861

SIR,—IN continuation of my Report No. 42, dated 12th March 1861, on the subject of Cotton cultivation in the Hyderabad Assigned Districts, I have the honor to forward copy of a letter No. 2131 of the 3rd of October 1861, from
Enclosure No. 1. the Assistant Commissioner in charge
Commissioner's Office, containing a Report upon the remarkable differences which had been observed in the Reports received from the two Berar Districts.

2. To ensure more reliable information being furnished in future Reports upon this very important subject, I have requested that, as suggested by Captain Cadell, the Deputy Commissioners may be instructed to have two or three

Cotton Fields in each Talook measured and the produce weighed during the present season.

From CAPTAIN W. CADELL, Assistant Commissioner in charge, Commissioner's Office Hyderabad Assigned District, To MAJOR A. R. THORNHILL, First Assistant Resident, Hyderabad,—dated the 3rd October 1861.

SIR,—IN reply to your letter No. 474 of the 9th March 1861, pointing out the discrepancies in the Cotton Statistics of the two Districts, I beg to subjoin the information subsequently received from the Deputy Commissioners on the points to which their attention was called by the Resident :—

W. Berar. E. Berar.

Yield per acre of uncleaned Cotton ..	207lbs.	192lbs.
Yield per acre of cleaned Cotton ..	60lbs.	52lbs.
Price of Cotton per 100lbs.	Rs. 11-7-0	Rs. 9-12-8.
Cost of separating 1lb. of Cotton ..		
from the seed	4 Pies.	2½ Pies.

The District Officers account for the remarkable differences between their present and former Reports by saying that, on the first occasion, only one Tehsildar was consulted, and that he must have misunderstood the questions put to him.

2. From there being no material difference in the data now furnished from the two Districts, regarding the yield and price of Cotton, and from personal enquiries made here, I am led to believe that on these points both Reports are correct. There is still a considerable difference shown in the cost of cleaning Cotton, and I am of opinion that the West Berar Report is nearly correct in this instance.

3. Any Returns of the yield of Cotton made without measuring the ground and weighing the produce, can only be an approximation to the truth, and should the Resident

think it advisable, the Deputy Commissioners might be instructed, during the present season, to have two or three Cotton Fields on each Talook measured and the produce weighed. The information thus obtained would be such that reliance could be placed upon it.

Report of failure in East and West Berar of the Experimental cultivation of cotton from New Orleans seed.

(Communicated by the Govt. of India.)

To A. H. BLECHYNDEN, Esq.

*Secretary to the Agricultural and
Horticultural Society.*

SIR,—I am directed to forward for the information of the
Home Dept. Revenue. Agricultural Society the accompanying copy
of a communication No. 133 dated the 16th
ultimo from the Resident at Hyderabad,
and of its enclosure reporting the failure both in East and
West Berar of the Experimental cultivation of cotton from
the New Orleans cotton seed received from the Bengal
Chamber of Commerce last year.

I have &c.

A. M. MONTEATH.

Under Secretary to the Govt. of India.

To LIEUT. COLONEL H. M. DURAND, C. B.

*Offg. Secy. to the Govt. of India,
Foreign Department, Fort William.*

SIR, With reference to your office letter No 1838 dated
Civil Department. 9th June 1860 requesting a report to be
furnished upon the last batch of New Orleans cotton seed forwarded under your instructions for experimental cultivation in the Hyderabad Assigned Districts,
Encl. No.. 1. I have the honor to enclose copy of a letter
No. 2136 of the 3rd of October 1861. from

the Assistant Commissioner in charge of the Commissioner's Office H. A. D. reporting its entire failure both in East and West Berar.

I have &c.

HYDERABAD RESIDENCY: (Signed) C. DAVIDSON.
10th October, 1861. Resident.

To the First ASSISTANT RESIDENT, Hyderabad

Dated Booldanah 3rd October, 1861.

SIR,—I have the honor to report that the New Orleans cotton seed forwarded with your letter No. Financial, 75 dated the 12th January 1861 did not germinate in East Berar. In West Berar it either did not spring up, or when it did, it soon withered away.

I have &c.

(Signed,) W. CADELL,
Assistant Commissioner in charge
Commissioner's Office.

Hints for the formation of Tea Gardens, and culture of the plant: By Dr. J. B. BARRY.

As I have been very busily engaged previous to my departure for England I have been unable to give more than a cursory glance at my notes, and as little time to the preparation of the few remarks I proposed to furnish you with on the subject of Tea planting in India. They must necessarily be brief.

It is scarcely necessary to say that Assam is not the only Province where Tea will grow luxuriantly. The time has gone when people alleged that the tea plant would only grow here and there, it being now admitted, that wherever we find a high average temperature, an annual fall of rain not under 75 inches, diffused very generally throughout the months of the year, a brief continuance of hot winds, a virgin ferruginous soil, eight or ten feet above the highest

inundations, here we possess all the requisite conditions for the successful cultivation of this Plant.

Such conditions very widely obtain throughout the hilly districts of Eastern India, particularly in Cachar, Sylhet, Munnipore, Tipperah, and Chittagong. In fact along the whole range of the lower hills running north and south from the Himmalayahs, to the lowest point of the Tenasserim Provinces. Throughout the whole of these tracts tea will thrive beyond a doubt. And in all these regions, we have a plentiful supply of rain, a high temperature, a suitable soil, and a moist atmosphere at all seasons of the year.

I apprehend no difficulty on this head ; but before the planter determines on settling, he will first ascertain whether he can command labor in the immediate vicinity of his location ; whether easy communication can be had with the sea board or not. He will naturally select such localities as are pregnant with the greatest advantages.

To those acquainted with the Eastern Frontier, it is well known that Tea in one form or another is to be found ;—we have it in Burmah and in Munnipore. It grows wild in Assam, in the Cachar hills, in Munnipore, and in Tipperah. Indeed to the Shan tribes, Tea has always been, what Coffee has been to the followers of Mahomet.

Tea is as indispensable to the one, as coffee is to the other. Whenever the Mohamedans proceeded in their line of March, coffee was conveyed and grown *pari passu* with their conquests.

This is seen in a very marked manner in Assam. The wild coffee tree abounds the whole way along the Northern banks of the Burrumpootra, and there only, except at one place on the range of hills upon a spur of which the station of Gowlparah stands.

This was the only station on the Southern bank that the Mahomedan army occupied.

When the shrub is in flower, the whole place looks very pretty, and can be seen for miles off.

The large extensive gardens of wild tea that have recently been discovered in the valley of Cachar, no doubt have sprung up in a similar manner, brought down from the neighbouring Hills, by the Shan tribes who, at one time or another, have occupied that particular Province. In no other way can we account for the partial, and compact form in which the plant is found throughout the country.

That we have found the plant so abundant in these places, we ascribe to accidental circumstances and not to natural causes. Entertaining this opinion, I look upon the cultivation of tea in other parts of India, just as certain as in Assam, provided the other circumstances are favorable.

In Darjeeling and the "Daman-i-kon" there are excellent lands for this purpose if properly selected. It would not be wise in respect to these places, to begin a plantation too high up on the Hills, as the plants would be subject to extreme cold and heat. On the one hand, vegetation would be retarded on the bleak mountain faces of Darjeeling during the winter months, while on the other it would be blasted by the scorching winds which prevail at certain seasons about the Daman-i-kon. However if the protected slopes, and gentle undulations that are to be found here and there between the mountain ranges and their off shooting spurs about Darjeeling, and the secluded valleys that abound within the Daman-i-kon, were opened out for tea cultivation, I am equally sanguine that the tea plant will thrive and prosper. The lands in both places are excellent. Gardens are already to be seen in Darjeeling.

I saw tea plants growing in the utmost luxuriance on one plantation, that had been well managed, which proved to me that the capabilities of the soil there, in favorable sites, were very great, not surpassed anywhere.

In the Daman-i-koh, the question has not yet been decided. One experiment however has been begun, which will solve the problem in another year.

Up to this moment, the progress of the nurseries has been most satisfactory. Seed sown in January, six weeks after sowing, have given plants, fully four and six inches high. If they bear transplanting in the rains, and vigorous trees shoot up, I consider the question settled.

If my expectations are realized, no one can foresee the immense benefits that will accrue to India from the discovery.

My application for lands there, has not met with that encouragement I expected. It is true the local officers have recommended it, but at head quarters, it has not I believe been favorably received. I do not however despair, for whatever the opposition, the Daman-i-koh will one day be occupied; as every opposition must give way to that spirit of enterprise and progress, which have marked our destiny in India.

Having settled to our satisfaction the locality of our Tea Garden, I shall now proceed to give a few simple instructions for its formation.

The land should have, if possible, a virgin soil, upon which nothing has ever been sown or planted. A primitive forest answers best. The soil should be diluvial, and have a red or yellowish character, so that on squeezing it in the hand, it crumbles into a coarse gritty powder.

If the grant be large, precipitous and conical hills should be avoided, as it is difficult to prevent the earth being washed away by the heavy rains. Low lands of an undulating character, or ranges of *teelaks* presenting more or less the appearance of table land, answer best. Such are more easily cultivated, more capable of management and more economically worked.

The grant should if possible be accessible by water, as

so much has to be conveyed to and from the plantation, that it will become a very heavy item of expenditure, should it be necessary to make roads and employ draught cattle to convey produce or goods to any distance.

Having fixed upon a grant, great care must be taken that a proper site be selected for the station. The highest spot should be secured for the Manager's residence and should be as near the centre of the gardens as possible, that he may be within easy reach of his work.

The best position for the coolie lines is on the bank of a running stream, where they can have easy access to pure water, for cooking, drinking, and bathing.

Should a river not be in the neighbourhood, wells of from 20 ft. to 30 ft. deep should be dug, and walled in so as to prevent the surface water from running in, and corrupting the water.

On no account should Jheel water be had recourse to, as it invariably brings on bowel complaints, fevers, spleen and every variety of cutaneous disease. The lines should be built widely apart from each other, the huts should be large, commodious, and well thatched, and in the immediate vicinity small patches of ground should be allotted them for cultivating vegetables and fruit.

In all cases, the land should be brought into cultivation for the purpose of sweetening the land, and preventing the atmosphere becoming vitiated by malarious miasma.

From neglect of this precaution I have known a most valuable property almost ruined.

The property alluded to was close to a Jheel, and very low lands, and nothing had been done for some years in bringing the land under cultivation.

The result was most distressing. Europeans as well as natives fell ill, time after time, and at last great apprehensions were entertained that the grant and gardens would have to be given up.

At length it was suggested that a crop or two of grain should be taken off the surrounding lands with advantage. This was carried out with the most surprising results.

What was at one time a perfect Golgotha became one of the best and healthiest localities in the Province.

Besides cultivating the lands, it is also a very good plan to plant trees all round the station, say from 50 to 100 yards off.

Trees seem to intercept all malaria approaching from a distance.

Nothing which can tend to preserve the health of the establishment should ever be neglected, as it is well known, where there is little sickness and a low rate of mortality the coolies soon get contented, and take a liking to the place.

Where the reverse is the case, a station notorious for sickness, soon becomes deserted, and the Manager has the greatest difficulty to keep his garden in any thing like order. It is therefore of the first importance to look to these small matters.

Should the Province not supply the requisite quota of labour, it will be necessary at once to procure labourers from Calcutta; where they can as yet only be advantageously collected.

Whenever it be practicable, Dhangars should be encouraged to migrate with their families. These men make the best cultivators, while the women and children come in extremely useful for weeding and plucking leaf.

The proportion of women to men should be as large as possible. It is calculated that two adults are able to keep three acres of land in perfect order.

While making the above arrangements, other operations connected with the garden should be progressing.

Throughout India there is no difficulty in getting men during the cold season, to clear forest land, and hoe the ground. It is during the rains that there is such scarcity of labor.

At the earliest moment, the contracts should be given out, so as to have everything well advanced when the seed arrives.

Contractors come forward readily and prepare the ground for about 8 rupees per acre. They are directed to cut down all but the very largest timber, which are allowed to stand for the sake of shelter until the end of the second cold season, when the whole garden must be swept clear of every thing but the tea trees themselves.

The lands must be well hoed, and cleared of roots and grasses, the deeper and cleaner this is done; the more rapidly will the plants grow, and the more certain will be the result.

This operation being over the area has to be staked in lines, which will vary according to circumstances.

If the seed be indigenous or hybrid it should not be sown closer than 5ft. apart. If it be of the China species, 4 by 4, or 6 by 3, is considered the proper distance. It is customary to sow three seeds at each stake, so as to secure at least one plant.

The depth of the seed in the soil ought not to be less than two, and not more than three inches when sown at stakes. If the earth is rough and lumpy two inches should answer, as in this case the clods around them will retain a certain amount of moisture which will go to aid the seed in germinating.

On the other hand, if the earth be well pulverized it will soon become dry, and the seed will shrivel up and die unless it be put down sufficiently deep to be protected from the scorching rays of the sun, and where it can get moisture from the lower strata.

The first plan I consider preferable. Having sown out all the cleared land, I should then advise the residue of the seed to be sown in nurseries.

As sowing in *situ* is attended with great risk, and in very

dry seasons becomes an utter failure, I would strongly recommend one half the seed of the year being laid in nurseries.

You secure in this way every part of your garden, and prevent the losses which the pioneers in this enterprize sustained at first.

In preserving the seed, there is great discretion required, as a large quantity of seed is lost, every year, from not knowing how to treat it.

Pitting—i. e., placing the seed in pits of five and six feet deep, alternately with dry earth or sand till it is full, is the most general mode.

This plan is objectionable, as the seed is often destroyed by fermentation, (produced by incipient germination of the seed in mass) before you are conscious that any heat has been generated.

The next plan is better—husking the seed first and drying it some what in the sun, so as to remove part of its natural moisture. This done I would have them placed on *muchans*, and mixed with as much dry sand as will cover them, examining them from time to time, so that on perceiving the slightest heat the heap can be opened and examined.

If heated and the seed beginning to germinate, they should be put into the ground at once. If the stakes are not ready to receive them, they should be put into nurseries without delay.

These again demand great care and attention in their formation.

The best method is that adopted by the natives of Bengal for raising sugar cane.

The land should be well sheltered and the ground prepared as for ordinary garden work. It is then thrown up in the form of beds, about 4 feet wide. The seed is then put in either by *dibbling* or by means of the finger and thumb as the natives do, in lines of 4 inches and about 2 inches apart; one and a half inches in the ground is ample.

After the seed is sown, it is a good plan to cover the beds two or three inches with grass, so as to prevent evaporation, and to generate heat in the beds.

Over the entire nursery, a temporary shed should be erected, as the natives do over sugar cane *Khets*; sufficiently high to enable a man to go in and water the plants when occasion requires.

The beds should be examined from time to time, and if the earth is dry should be well watered. When the plants spring up, the grass covering should be removed, afterwards as the plants become larger, the shed should also be taken away, but only by degrees a little now and again until the whole is gone. Full exposure to the sun's rays for five or six weeks is deemed essentially necessary to harden the plants, and enable them to bear removal into the open gardens during the rainy season.

After the rains have well set in, the garden must be closely examined, and the superfluous plants removed to where there are vacancies.

Only one healthy plant should be left at each stake.

After the garden has been thinned the nurseries may be indented upon to fill in the vacant places.

The mode of transplanting is simple enough. A spade is thrust down into the soil, and the plants shaken as it were out of their beds, and are carefully taken up in baskets and removed to their destination.

Holes made by dibbling are found to answer best, in this way the root is kept straight up and down.

If the *tap root* is put in crooked, so that it gets a turn upwards, it continues its bent towards the surface, and dies.

The sooner young plants can be transplanted after the rains set in, the better. Those put into the ground in May and June, all take root and live, while those transplanted in August seldom survive the dry season.

When the garden has been well filled, and plants still remain in the nurseries, it will be necessary to preserve the plants so that they can be turned to account the following season, either for filling in vacancies, or extending the garden.

After many trials, it has been found best to remove all the plants from the beds, and to plant them out in continuance of the old garden so closely that in the following year, they can be thinned out so as not to interfere with the permanent lines. Supposing the plants to be placed 12 inches apart either way, so many must be removed as will leave the stakes of the same distance as in the old garden. This plan is preferable to keeping them in the original beds, as it is found when they are a year old, that the roots of the plants get so closely entangled as to render a separation without danger almost impossible.

Transplanting large plants, say of 18 months old, is done somewhat differently from that adopted with younger seedlings.

The plant in the previous cold weather should be cut down within a reasonable distance of the ground while the sap is down, and when the rains set in, the plant should be raised with the surrounding earth, and carefully removed to where holes have been made ready for their reception: Should the tap root project any distance it ought to be removed, lest it grow towards the surface, when it will perish as explained before.

Manuring the plant, as has been done in some places, has been attended with the worst consequences. It becomes the nidus for insects, and deprives the plant of its natural food, which must retard its growth. The system of making big holes, and filling them with manure, before putting in the plants, cannot be too strongly deprecated.

The gardens once clear should be kept scrupulously clean by deep and continued hoeing; the deeper this is done to

open up the earth, and expose it to atmospheric changes, the better it will be for the plant, and for the development of seed and leaf.

I calculate that there should be at least not less than six hoeings a year, fully ten to twelve inches deep.

When the plants have entered the second year, it will be necessary to trim them, so as to leave a clear stem for some distance above the ground. Doing this when the plant is young is a most easy matter, a mere twitch with the finger & thumb separates it, while it takes a good strong wrist to cut them off when the wood has become older and harder.

Pruning or cutting down the plant, should be postponed to a later period; perhaps the following cold season or the beginning of the third year.

December is the best month for pruning.

Supposing the stem to have been well trimmed, as previously described, cutting off the top above the third or fourth branch, (counting from below) will not be too low. This operation will cause the plants to throw out laterals in all directions, which in their turn will have to be lopped off the following season in a similar manner to that described above.

If the plants have been properly treated, and the ground been properly tilled, 100 lbs an acre of manufactured leaf may be obtained without injury or detriment to the young plant in the third year.

On no account should the plants be over plucked, for continuously plucking stunts the growth, and throws the garden back. It may be done however safely by care.

Respecting the manufacture of the tea itself, I would just remark that the time is at hand, when the present laborious and expensive modes of manipulating the leaf, must give way to the simpler and more certain way of treating it by machinery.

Plans are already drawn out and moulds made by an experienced Engineer illustrating the various methods of rolling, softening and firing the leaf as well as drying and sifting it when manufactured.

The discovery is pregnant with the grandest results to the tea planter, at a time when there is such difficulty in procuring labor for the tea districts.

In conclusion let me offer my apologies to you and the Society for the hurried and imperfect manner in which this letter is written.

If time permitted I should most certainly have given you a fuller discription, and a better article :—for the present I must say adieu.

GALLE :

16th March 1862

THE GARDENER'S NOTE BOOK-NO. 5

Culture and Manufacture of Tapioca, (Jatropha Manihot, :)

BY J. P. LANGLOIS ESQ.

Soil This plant will thrive in any soil, although a sandy loam is the best.

Cultivation It requires no cultivation whatever, and is occasionally met with in Arakan, growing wild in the Jungle.

Propagation. By cutting. Care to be taken to use the stronger branches. The cutting must be from two to three feet long ; to be placed in the ground in an upright position, and in rows, four feet apart.

Preparation. Twelve months after planting, the roots are fit to be dug up. They must then be well washed, and put into a trough with water, in which they are allowed to remain six hours, when the outer bark will be easily removed by a pressure of the hand. The next process is to grate the roots, and then press out the milky juice, which is

poured into a flat tub. This is now suffered to rest for 8 hours, when all the flour will subside to the bottom. The water is then poured off and the meal laid upon wicker-frames to dry in the sun; for two or three hours. The flour is then placed upon hot plates, and well stirred, to prevent it burning.

The heat will cause the amylaceous substance to coagulate into small irregular lumps of a transparent and gelatiniform colour. The Tapioca is then ready for use.

This is the best mode of preparing Tapioca, as customary at the Mauritius.

Report on samples of Cotton from Arracan and Oude.

To THE MEMBERS OF THE COTTON COMMITTEE.

GENTLEMEN,—I beg to circulate for the favor of your opinion the samples of Cotton from Arracan and Oude, noted below, as also the letters of Major Ripley and Mr Saunders regarding them.

METCALFE-HALL.

A. H. BLECHYNDEN.

22nd. Novr. 1861.

Secy.

No. 1 From Egyptian Seed cleaned by hand. Seed sown 29 April, picked 28 Octr. 1861.

No. 2 From Ditto --mixed--cleaned partly by hand and partly by native gin. Seed sown 23rd. April, picked on 23 Oct. 1861.

No. 3. Native white Cotton from the Koladyne River.

No. 4. Native Nankin colored cotton from Do.

No. 5. Small sample of cotton raised at Seetapore Oude, from New Orleans seed.

Extract of a Letter from Major F. W. RIPLEY, dated Akyab, Arracan, 31st October, 1861.

By this steamer I send up another small packet containing samples of cotton:

No. 1. Is a sample of Egyptian cotton cleaned by hand from some that was planted at Mr. Halliday's plantation on the sea coast about 4 or 5 miles from this Station. The soil chosen was light, sandy, and but slightly manured; the seed was put down in April after the first shower. The plants were lopped in August and came into splendid bloom, but the worm attacked the pods and but little cotton will be saved.

No. 2. Is a mixed sample cleaned partly by hand partly by native gin from same plot.

No. 3. Is another sample of cotton from the Kula-dyne river, that sent last was yellow colored;—this is the white species. It is only grown for house consumption by the Hill tribes.

I have distributed nearly all the seed you sent me but regret to say that I have had nothing; but bad reports of the Sea and a few Calcutta seed have germinated. We are now giving them a fresh trial in beds within the station.

What is the earliest date at which fresh cotton seed can be procured in Calcutta? The natives here ask to have more seed distributed in April and May which they may sow in their Jooms or hill clearings. I should like to try some of the Pernambuco cotton which is I believe a perennial. It is most disheartening the failure of the seed, we have been disappointed the last two seasons, last year I received a cask of seed from the Agents of the Manchester Association but it also failed. These repeated failures render the natives and Mughs especially averse to trying foreign seed.

*Extract of a letter from P. SAUNDERS, Esq., Cotton Commr.
dated Lucknow, 8th, Novr. 1861.*

I have the pleasure to send under a separate cover a small sample of cotton grown from New Orleans seed in a

garden at Seetapore, Oude. The seed was sown in the latter part of June and the pods plucked by me in October. I will be glad to have the opinion of your Cotton Committee on the quality of the cotton in order that I may embody it in my Report from Oude which I hope to deliver to Government in a month or month and a half from this date.

Report by Mr. Stewart Douglas.—I beg to report on the cotton samples received from you today.

Mr. P. Saunders Senr.

Cotton in the seed, grown in Seetapore Oude—from New Orleans Seed.

This cotton is, of good color, good staple and strong fibre ; it is impossible however to give a very correct valuation of cotton in the seed ; this is however a useful kind of cotton, and if cleaned would be very acceptable in the Liverpool market.

Major Ripley's samples from Akyab.

No. 1. From Egyptian seed, cleaned by hand.

This is a particularly excellent cotton and is possessed of every essential required by the Spinner, being of good length of staple, very clean, soft and of good strength and color. Any quantity of such cotton would be acceptable in Manchester.

No. 2. Is of the same character but the condition is bad and there is a large porportion of it stained which deteriorates its value very materially.

No. 3. Native white cotton from the Koladyne River.

This is a cotton quite unsuited to the English Market, being coarse harsh and of very short staple, but it possesses strength of fibre which is its only good quality.

No 4. Native Nankin colored cotton from the Koladyne. ~~It is~~ the above in character rather more harsh and quite unsuited to the English Market.

Calcutta : 23rd Novr. 1861.

Report by Mr. W. Haworth.—1. Cotton from Egyptian seed (grown near Akyab) This is a fine specimen of cotton, the staple equal in strength of rather finer fibre, and I think a little weaker than the best Egyptian sent home. Its ordinary price in Liverpool is about $8\frac{1}{2}d$ per lb but under the present exciting causes, it was worth about $11d\frac{1}{2}$ per lb over the latter part of October.

2. Appears to be the produce of the damaged pods grown along with the above. It is much discolored, shorter and weaker in staple than No. 1 and it is difficult to place a value on it. I think *much* of the sample would have been saved in nearly as good order, and in every other respect nearly equal to the No. 1 had the pods been taken from the bushes, as soon as they had shown signs of opening a little; it is a point of the utmost importance, that the pods should not remain exposed to night dews after they have commenced opening, or the cotton will be stained.

3. Native white cotton from the Koladyne River.

The color is good, the sample very clean, the staple is harsh, strong, but *very short*, so much so, as to be useless for spinning purposes.

4. Native Nankin from the Koladyne river is so exceedingly harsh and short in staple together with its peculiar color, as to be useless for manufacturing purposes.

5. Cotton raised from New Orleans seed at Seetapore, Oude, forwarded by Mr. P. Saunders Senr.

The color, staple, strength of fibre are all *good*, and the sample compares well in every respect with middling Orleans, its ordinary sale rate in Liverpool would be about $6d\frac{1}{2}$ to $6d\frac{1}{4}$ —but the October advices make it then worth $10d$ per lb.

This description of cotton is consumed in Great Britain in larger proportion than any other, and the Indian growers could not do better than persevere in producing such, *if* the first named price would be remunerative under ordinary circumstances.

26th November, 1861.

Report by Mr. C. A. Cantor.—I have examined the musters of cotton.

No. 3. and No. 4. Native cotton.—Very short staple and harsh.

No. 1. From Egyptian seed.—Excellent staple clean and good color.

No. 2. From Egyptian seed.—Good staple—the color is *not* good.

No. 5. From New Orleans Seed.—Has *not* been cleaned, is full of seeds—the staple is very good and the color is good.

Notes on certain plants, seeds, and roots from South Africa :

By Capt. W. H. LOWTHER, Bengal Army.

[The plants, seeds &c. referred to in the following notes, were contained in 3 glass cases, 5 wooden boxes and sundry baskets. They were brought by Capt. LOWTHER, in the *Pestongee Bomanjee* which sailed from Algoa Bay on the 4th January, and arrived at Calcutta on the 26th February 1862.]

1. Probably the expenses connected with this collection of plants and cases may be considered exceedingly extravagant, but I will merely explain the fact by stating that the Eastern Province of S. Africa is just now the Utopia to which British Emigration is congregating and everything is now assuming therein the Australian type of expenditure. When I state that a shopfront in the main Street of Port Elizabeth was sought for at £ 50 *per square foot* and the offer refused, and that Native labour in that town is up to 7 s. 6 d. *per diem*, strangers may form some notion of the ruinous style of existence in that Colony.

2. It was my intention to have left S. Africa 2 or 3 months sooner, but it is very difficult to find ships *direct*, and the one I selected has been detained by various causes, very far beyond her anticipated period of time; hence everything for the Society was packed long before the departure of the vessel, and has therefore met with disadvantageous treatment, but far more important is the *season* in which I

have been compelled to undertake the transplanting, and removal of the numerous beautiful, and desirable plants bulbs, and roots.

3. I think I have before communicated to you that the *end of the S. African Winter i. e.* middle of August would be the most suitable period for the shipping of all living plants in Wardian cases: they are then in a hardy, dormant, condition, the climate temperate, and free from any changes likely to injure vegetation; and what is of more consequence they would reach Bengal just at the commencement of its most favourable season, the winter.

4. Under present circumstances, I fear there will be a large per centage of loss, entirely owing to removal from the soil during hot weather, for the temperature in the sun at Uitenhage had actually stood at 130° by the thermometer. I have been actuated solely by the wish to introduce a proportion if possible of the many splendid plants I found in the Province, and as far as my own personal supervision could avail, the collection has received every possible care and attention from myself.

5 Whenever a person can be found to take charge of cases containing growing plants, I recommend that there may be a sliding pannel, or pane of glass, through which the hand may be introduced to give a little rain-water at pleasure, or to admit fresh air, which in the case of all hardy plants is most desirable, and I was told by Mr. Brehm's Gardener that the finest lot of Camellias ever received from Holland, arrived with broken glasses. The admission of air except in fine weather is, however, objectionable, as a high wind brings down a "salt fog, or dew," deadly to vegetation, and by which I lost a few choice plants I brought over from Cape town by sea for Mr. Brehm; they were in open pots, merely sheltered slightly by being in a deal case without a cover, and one night's high wind was fatal to them. (a)

6. There would be little difficulty at Mauritius in finding

some "returned coolly" who could look after the cases during the brief voyage to Calcutta of one month's duration; and the season of the year should be the same as above mentioned, or perhaps a little later.(b)

7. Mr. Brehm's Gardener expects that all the S. African bulbs packed by him in the wooden case ought to reach you in prime order, in his words they would "go all round the world" in safety, and as the hold of the *Pestonjee* is open, and nearly empty, I feel tolerably sure of a large proportion reaching you in good order; and the same with the *Dahlias* which are too of the *most choice named varieties procurable*. The *Potatoes* I fear, from the delay in the departure of this ship, will have gone to decay. Should such be the case I recommend another trial on a larger scale in proper season. The *Zamias* are very hardy travellers, provided the *scale* be not injured:—*then*, they decay; a very ancient one of 16 *feet* in height was lately packed, and sent to Holland in a long deal case, and it actually *grew* in that state and is now the chief ornament in a Palm House! They require an arid, dry, climate being from the "*Karoo*" or Desert. In the same case is a long sample of the *Water Rush*, some in its *natural* state, and another lot beaten with the mallet for *use*; it should be *wetted* previous to trying.(c)

8. There is a hamper of "*cuttings*" (dried up I fear) and some baskets of Aloes, Bulbs, Roots of the useful *Broom grass* (*Aquatic*), Bulbs of the splendid *Cyrtanthus*, &c. &c.; and I have done my best to bring you the most useful *Mesembryanthemums*, but much doubt whether I shall succeed in preserving them—they decay so rapidly. However there is a good packet of seed; the great one for bedding on sandy soils,—2, or 3 other edible, and ornamental species.(d)

Notes by Mr. ROBERT ERRINGTON, Head Gardener to the Society.

(a) The great loss among the plants brought by Captain Lowther, I consider, is in a great measure owing to the cases being too closely

fastened down, by putty or some kind of cement, as if to exclude all fresh air. I think that the plants would receive but little harm if they stood in the cases 6 months, provided they were watered occasionally and plenty of fresh air admitted; the lids or covers ought not to be screwed down too tight, as the moisture arising, not having the means of escaping, soon rots the plants altogether. Many of the plants in these cases were quite mouldy when we opened them, and such cases, ought to be put in some place where the sun would not shine full on them, as in this case they would get scalded, and if no moisture arose, they would be quite burned up. The best place on a vessel would be where they would be fully exposed to the light, but be protected from the sun's rays.

(b) As the plants require some attention on the voyage, this might no doubt be done, on applying to the Captain or Chief Officer, to allow the Carpenter or some other person of the vessel, to take the cover off once or twice on the voyage for an hour or so, during fine weather; not to be kept off long, and never at night.

(c) The bulbs packed in boxes, were most of them in good condition, a few only being decayed, some of them are now commencing their growth. The potatoes were quite destroyed, apparently a few decayed ones had caused fermentation, they being so hot on being opened, that we could not bear our hand in among them. The Water Rush is now growing strong.

(d) The plants in the baskets suffered very much, being nearly all dried up, the aloes however are all alive, and now commencing growth; three plants of *Cyrtanthus obliquus* being alive, *Mesembryanthemum* the large kind, cuttings all dead, we have some seed of it sown, but not yet germinated. Of the small kind we have several seedlings come up, nice healthy plants. Of *Brugmansia Knightii* one plant living rather sickly.

March, 1862.

Of the Cuttings in the Glass Cases.

Arduina grandiflora, or *Natal Plum*. (A gigantic species of our *CARISSA Carandas*.) The two cuttings seem to be alive but have not grown. Bengal is just the climate for it,

hot, and moist: the seeds of it from the Cape Botanical Garden, in spite of every precaution in drying, do not appear to have kept well,—the fruit is *so juicy* and given to fermentation.

The cuttings, *Pereskia*,—called “*Barbadoes cherry*,” have struck into pretty plants: this fruit makes nice tarts, and preserves.—I see one vigorous cutting of *Brugmansia suaveolens* (single), Moonflower of the colonists. The S. Af. *Buddlea* cuttings I regret to say seem dead; it is an elegant shrub as you will see among the dried specimens: there were no rooted plants to be got at the time. The handsome *Clematis smilacifolia*, a fine evergreen arbour creeper, with *Yam like* leaves, of which I put in some cuttings, is gone I fear. With reference to all the dead plants, I recommend the Gardener to copy out a list of them, and you will be enabled to procure them some future season.

A pretty, twining *Asclepias* with curious flowers has struck well, and is rambling about.

The *Tacsonia* cuttings I fear are done for, 3 kinds. *Brugmansia sanguinea* was only *just* struck from the English parent when I got it, but it *looks well*.

[Of these cuttings, all were dead on arrival here. I have no doubt they would have done far better if stuck in the soil in the cases. The *Pereskias* are doing well, but they were not in glasses, but in the cases. *Brugmansia suaveolens*, S. A. *Buddlea*, *Clematis smilacifolia* and *Tacsonia* are all dead. R. E.]

Notes on some of the Plants and Seeds.

The large *Mesembryanthemum* for covering sandhills has not travelled well—in part it appears *dead*, still 2 or 3 cuttings in sand exposed to the sunshine *might* strike however you have plenty of the *seed*.

The ~~Mesemb.~~ *Mesem.* used as a tart fruit and for preserves has done I think on rockwork in a dry climate most of it

will resuscitate as I have seen it do in a natural state, (after *months of drought*):—the little *twiggy* one is 'still alive in parts, and ought to be tried as cuttings in sand, and gravel slightly moistened: it is merely ornamental. The *Aloes* as I expected have travelled well, they lie in the bush without any soil on their roots for months together and seem to grow all the time, and sea water does not seem to injure them. They have been on deck all the voyage. I wish the *Cactus* varieties were as hardy, for I have brought you some very beautiful specimens, chiefly S. American. I think the bulbs of *Cyrtanthus obliquus*, and tubers of the *Broom Rush* are in good order:—the *Shallots*, too; for they are sprouting. The fleshy seeds of *Natal Crinum* (*Crinum aquaticum*) in the glass bottle have commenced germination, and are *spoiled* I fear, however, there is the small experimental *packet* in paper of which I am sanguine. Although the *Blue Water Lily* in the glass case has lost all its leaves, I see at least one healthy crown of green shoots; it should be planted immediately in some partially shaded *pond near the stream*, or spring which feeds it, so as to be on *moving water*: the soil should be mixed sand, gravel, and old rotten vegetable mud, the water any depth, (not too shallow). I think the N. W. P. will eventually suit the Water Lily as it wants a *dormant* season.

[The *Aloes* were much withered on arrival here, but are now strong plants. The *Cactus* have not suffered much, but are now taking root nicely. *Cyrtanthus obliquus*, *Broom Rush*, and the *Eschalots* are alive, and all doing very well, also *Crinum aquaticum*, and the blue water Lilly; there are 2 or 3 plants but in very sickly condition. R. E.]

Memorandum on the "*Spek Boom*."

There is, perhaps, no plant in all the vast territory of Africa of so much Agricultural importance as the *Spek Boom* ("*Elephant's Food*," of the Colonists,) for alone through

its bountiful distribution over the desert waste is he enabled to nourish, and fatten his flocks and herds, during the annual droughts of the cold season : *then* the once beautiful turfy plains, and broad pastures are burnt to the very roots, and as there is no description of dry forage in stock, or store, the existence of the very numerous sheep, and goats would be sealed, and wool farming annihilated :* but ever-provident Nature has here scattered an all sufficient pabulum in the very hardy, and succulent Bush of the *Portulacaceous* Family now brought to your notice, and of which I have managed to bring you several healthy specimens which will doubtless prosper in the *N. W. Provinces*,† and which you should at once commit to trusty and zealous hands in that direction. As it multiplies to any extent from cuttings, however small, I see no limit to its general propagation. All herbivorous creatures, both wild and tame, appear to feed, and fatten on it, and in many places it must afford (together with the larger *Mesembry anthemums*) a cooling substitute for water, being of a pleasant subacid, juicy quality.

Some of the old Colonists of 1820 related to me how their only *tarts* in those days were furnished by it, being no bad imitation of Rhubarb, and I can speak from personal experience of the refreshment I often found in my rambles from sucking its shoots and leaves.

Notes on various useful Grasses now introduced.

1 "*Livingstone's Broom Plant*," a *Holcus* apparently, for I lately saw 2 or 3 young growing plants in S. A. should do well in N. W. India and I bring you a further supply of *old* seed, apparently attacked by moth but you *may* save a per centage:—Mr. Judy has promised to save all he raises this season for the Society (it must now about be fit to

* *Horned cattle and Goats* are most greedy of it ; sheep only eat it when grass is unattainable.

† Sheharunpoor,—Deyrah ? Lahore—Meerut &c.

reap). All the American brooms appear to be made of it—a cleanly,—durable, material it is; and Livingstone found the grain made excellent pancakes.

2 The *thatch grass* of the Eastern Province is highly spoken of for durability: after a period of many years, it is found to be quite serviceable when pulled to pieces again. I could not get you a *new* specimen, and took the present one out of a heap in use.

The *S. A. "Broom Rush"* is a most useful article in general use among all the colonists and Natives, for outdoor brooms, made up after the fashion of our English birch brooms: the tubers appear to have travelled well: although an *aquatic*, it grows chiefly in the swampy bed of a hill river: the soil being gravel, sand, and decayed vegetation or black mud among Boulders, and broken rocks.

4 The *Sea Grass* is a *marine* weed used generally for stuffing mattresses, pillows, furniture and all other materials being high priced in* the colony.

5 The *Water Rush* of S. A.—I cannot sufficiently praise the usefulness of this aquatic grass, and it seems most hardy: mats, ropes, twine, ties,—and packing are all manufactured of this very *pliable* though *tough* Rush. It should be wetted while in use, and must be beaten with a mallet before twisting.

List of Plants now living.

No. of
plants.

83. *Amaryllis Belladonnä*, and other sp.

8. *Aloe S. Africa*—strong.

3. *Babiata* sp.—quite useless.

2. *Watsonia* sp.

1. *Kalanchoe* sp.

3. *Cereus grandifloras*—cuttings.

1. Ground Orchid.

2. Tree Orchid—sp. *Angrœcum*.

* Samples in "Zamia" Box.

6. *Agave Americana*.
3. *Sansevieria Capense*.
3. *Cyrtanthus obliquus*.
1. *Cycas revoluta*—2 of these dead.
2. *Apocynum* sp.
6. *Euphorbia*? appears to be *Echinocactus*.
1. *Yucca aloefolia*.
1. *Strelitzia Augusta*.
1. *Hebeclinium zautheimum*.
1. *Sutherlandia frutescens*.
2. *Pereskia*.
1. *Phormium tenax*.
1. *Fuchsia fulgens*—rather weak.
1. *Stephonotis floribunda*.
3. *Spek Boom*.
1. *Buddlea Madagascariensis*.
1. *Brugmansia Knightii*.
1. *Camellia*—2 of these dead.
2. *Eugenia Reiwarter*—doing well.
2. *Bougainvillea splendens*—good plants.
2. *Lonicera brachypoda*—nice plants.
2. *Tradescantia discolor*.
1. *Tecoma Capensis*—nice plants.
1. *Cape Jessamine*.
1. *Bignonia camperlata*.
1. *Bignonia pandora*.
1. *Wistaria Sinensis*—rather weak.
1. *Acanthus mollis*.
68. *Dahlias*—doing very well.
3. *Broom grass*—doing well.
1. *Calla Æthiopica*—doing well.
3. *Natal Lilly*.
4. *Water Rush*—growing strong.

Plumbago Larperia rather sickly, may recover, and a few others we are treating as cuttings, but at present rather doubtful. Also plants of different kinds name unknown. The *Azaleas* all dead ~~now~~. Three seedling *Kalodendron Capense*, a few seedlings of

Passiflora alba, a great many annuals of different kinds, are going back, although kept in shade. The Escholats growing well. Some Kaffir corn in Kitchen garden doing well. Also some pumpkins in ditto, suffering from insects.

ROBERT ERRINGTON.

March 1862.

*Reports on trial sowings of Field crop seeds during season
1860-61.*

[This consignment arrived in September 1860. It was immediately advertized for public distribution in the newspapers, notice having been previously given to the Members of the Society through the medium of the Journal. Applications were received from Sept. 1860 to January 1861 from 60 persons resident in various parts of the country, viz : Bagrasat, Jessore, Boorbhoon, Bancoorah, Berhampore, Malda, Rungpore, Baugulpore, Tirhoot, Shahabad, Gya, Sumbulpore, Sonthal pergunnahs, Dacca, Cachar, Oude, Futteeghur, Etawah, Banda, Roorke, Umritsur, Darjeeling, Mussooree, Kemaon, Deyrah Doon, Ellichpore, Port-Phair, and Moulmein. Of these 60 applicants 33 received large supplies of nearly all kinds, while 27 received small quantities only of certain sorts of seeds. In August 1861 a circular letter was addressed to these 33 applicants, requesting them to communicate the result of their sowings of season 1860-61. The following are the replies received, which though less full in several cases than could be desired it has been thought desirable to publish by way of record.]

OFFICIATING SECRETARY LOCAL COMMITTEE, BARASET,.—
In reply to your letter dated the 19 instant, I have the honor to state that the seeds of the following cereals, viz. mustard, potato, oats, black tartarian oat, chevalier barley, golden melon barley, marygold wheat, dwarf Essex rape, spring vetches, early racer tares were sown in November last; and those of American maize and Pettigulf and Sea Island cottons, were sown in May last. The barleys, the oats and wheat did not germinate at all, though every possible care was taken before hand to prepare the ground for their reception. Some cabbage seed were, perhaps through an oversight, sent as mustard seeds, they were inadvertently sown broadcast and grew up very well, but they did not form compact heads as those of other cabbage plants rea-

red up in the nursery and thence transplanted, did. The rape, the vetches and tares germinated well, but did not live to ripen and form seeds; they soon became sickly and withered away. The American Maize seeds were for the most part injured by worms before the sowing season arrived; the few that remained sound and entire were sown on the same plot of ground alternately with the cotton seeds, but neither of them germinated. Care was taken by the mall-eyes as regards the ploughing and manuring the ground with cowdung before the seeds were sown and watering them afterwards. Most of these crops failed owing as far as I can judge either to some defects in the soil or to the seed being old and wanting in vitality.

31 August 1861.

MR. THOMAS F. KILBY.—In reply to your favour of 19 instant, I regret to say that, being absent from Chandpore many months, I was unable personally to look after the sowings of the field seeds supplied in last season, and through the neglect of my people a satisfactory trial was not made.

CATECHANDPORE JESSORE: Aug., 21.

MR. HENRY, G. FRENCH.—I beg to say that the field crop seeds reached me too late last year to sow; however I tried the clover which came up splendidly, the seeds ripened and fell from which fresh plants came up, and still exist although cut and eaten down as required.

JESSORE: Sept., 1st.

MR. W. COCKBURN.—I duly received yours of the 19th instant and should have answered before, but have been from home. With regard to the field crops, the seeds of which I got from you, not one of them came up. I sowed them all in fields. I am inclined to think the seeds were damaged, as I observed when I got them from you, there was a dampness about them.

RANEEGUNGE: Aug., 27.

MR. J. M. G. CHEKE.—I am in receipt of your letter of the 19th instant calling on me for report of the result of the sowings of field crop seeds forwarded by you last year. I, as requested, beg to inform you of the result.

Barley	}	None of these germinated.
Cotton		
Linseed		
Oats	}	of 3 different varieties, all vegetated, but yielded very badly.
Grasses of sorts, all bad.		
Clover	}	All good and yielded satisfactorily.
Lucerne		
Trefoil		
Mangel wurzel	}	All good, and yielded well.
Field carrots		
“ Turnips		

The above mentioned seeds were all sown in rich garden soil, and with the exception of the cereals and cotton all turned out satisfactorily.

BANCOORAH: 23rd August.

MR. H. C. ERSKINE.—In compliance with your request for a report of the result of a trial made last cold season of the field seeds received from the Society, I have the pleasure to state generally that of the grass seeds the *lawn*, *lucerne* and *clover* gave a very fair crop with frequent irrigation. From the *tares* I got a very poor return—though they germinated freely enough. I attributed this partial failure to the lateness of the season they were sown. The *Peas* gave an ordinary crop.

Of the cereals the *wheat* and *barley* were all but failures, neither germinating freely nor yielding a fair proportion of ears. The *oats* sprung more freely, but did not yield what would have been a paying crop. The *Mangel Wurzel* was a decided success and served as a relish to the cattle for many weeks. They grew to a great size, were sweet and pretty

free of stringiness—were hardy and required little care. In the absence of *neez* land I would not feel inclined to try any but the oats and the mangel wurzel again.

ELLAMBAZAR, SOOROOL : *August, 23rd.*

MR. J. P. MEIK.—I am in receipt of your letter of the 16 instant, and sorry I cannot give you a report of the result of the sowing of the seed of field crops I received last year from the Society, having put down only a portion of them, which never came up from want of rain, and when some months afterwards I looked at the remainder of the seeds I found most of it spoiled.

SUMBULPORE : *August 30th;*

MR. CHARLES HOLLINGS.—In reply to your enquiries regarding the results of my sowings of field crops last year, I regret to inform you that they totally failed not only in all cases of my own sowing, but also when tried by Messrs. Lautour and Morris, to whom I gave some of the seed. The only exception was the "Guinea grass" which when irrigated grows very well and is excellent fodder for horses and cattle and flourishes vigorously. Indeed it spread itself spontaneously beyond its proper bound into neighbouring fields which are watered and in which other things are being cultivated.

GYA : *August 24th.*

MR. B. B. LANDALE.—I am in receipt of your letter of the 19th August, but owing to my having left Dheree in January last, I am sorry to say I am unable to give the information required regarding the field crops. Some of the seeds came up pretty well but the wheat, barley, mustard, and one or two others were perfect failures and did not even vegetate.

DHEREE : *August 26th.*

MR. W. BINGHAM.—I have yours of the 19th and 22nd August, and am very sorry that I can give you no in detail of my sowings of field crop seeds of last

year; as I am sorry to say from one cause or another they all failed. The primary cause was their late arrival, the season was too far advanced for them:—the oats germinated well and promised well, and the stems were at least three times as thick as the country-grown oats, but they took longer to come to maturity and ought therefore to have been sown much earlier. The hot winds were on them before the seed was formed, so that all I gained by sowing them was experience for the future. The tares also came up well as did most of the seeds, but did not come to maturity from the same cause—lateness of sowing and length of time required for them to ripen; they took English time about it, and consequently ought to be sown before Indian time. Again, last season was a very exceptional one, there was no moisture in the ground, and I had no adequate means for irrigation. All grain crops were consequently a failure. I shall try to give you a report this year, and will keep a memorandum for the purpose. I hope I shall receive the seeds soon; as I want to take advantage of the season and to appropriate my land according to the description of seed sent. I hope you will have despatched them before this reaches you, as they take a considerable time to reach me.

CHYNEPORE, SESSARAM : *Sept. 12.*

MR. LEWIS COSSERAT.—The farm seeds were failures with me or nearly so. I had as follows:—lucerne excellent, it has yielded 2 cuttings each of a cubit high to 15th May since which date rain has fallen and a fresh green crop will be ready in all June; white clover was nearly a total failure, the red was better, and half the plants still alive, all the above were transplanted from seed beds to a field that had lain fallow during last rains and off which a heavy wheat crop had been taken in 1859-60. All these had the benefit of irrigation but the clovers could not stand the heat of April and May whilst the lucerne could I think have done without water, even

the mangel wurzel yielded a thin crop and would not have weighed off more to the acre than a good crop of the common country white carrot, I weighed the following roots;—4 of long red 7 seers Bazar weight, 4 globe red $4\frac{1}{2}$ seers, 4 of orange red $5\frac{1}{2}$ seers. I tried various ways of getting them to seed but was not successful, the turnips were good and at all seasons should yield green food for cattle early in the cold weather before carrots or sugar cane are ready; the vetches, though in first rate land for such a crop came up and died off after getting about 6 inches high. None of the different sorts of wheat came up though sown at the same time and in the same plot with country wheat that gave a fair return for such a dry season. The different sorts of oats were sown in a patch of land a part of which was also sown down with the common country or Patna oats; the latter gave a fair return in due season but the plants from imported seed though growing much stronger than the others came to flower much later and the result was very unsatisfactory, the grain had evidently deteriorated much from the original seed.

BURHOGAH VIA SEWAN: *June, 9th.*

CAPT. JOHN STEWART.—The Field seeds, of which you sent me a good quantity, proved very good. The mangel wurzel flourished beautifully in a fine rich soil, and I found my cows got very fond of it.

Cawnpore is not a good soil for clover and field grasses.

CAWNPORE: *May 30th.*

MR. H. W. DASHWOOD.—In reply to your's of the 19th instant, I regret to say that, owing to frequent absence from the station and other causes, I was unable to make a trial of the Field crop seeds received from you last season. My garden which had for several years been allowed to go uncared for was not ready for the experiment last year. At the commencement of the present rains, I sowed some of the grass seeds, but whether the seed was old, or it

was the wrong time of the year for sowing, nothing came up.

BANDA: *Augt 25th.*

LIEUT. COL. EDWARD MONEY.—With reference to your letter to my brother Mr. W. B. Money of 19th August last asking for a report of the sowings of the field seeds received from the Society, I have to inform you that they were sown by me up here, but that in all cases they failed owing, however, I believe, to my ignorance of the proper season to sow them. This is not yet known by any one up here in the case of many of the field seeds received, but I hope when I gain the experience necessary to be more fortunate with such seeds as I may essay later.

NYNETAL: *Octr. 25th.*

CAPT. A. P. W. ORR.—In reply to your letter of the 19th ultimo, I regret to say I cannot furnish you with a report in detail of the result of my sowings of the seeds supplied by the Society last year, not having kept a memorandum. But I must not omit to mention that the vegetable seeds produced a good crop, the grain was a total failure.

MONASTERY, MUSSOORIE: *Sept. 2nd.*

MR. C. R. CROMMELIN.—I received your letter of 19th ultimo only yesterday morning, and am sorry that I cannot give you any detailed report of the result of the sowings [at Roy Bareilly] of the seed received from you. The vegetable seeds generally came up pretty well. Of the grass seeds a small quantity of 2 kinds came up, what those kinds were I cannot say not having the papers with me. The seed was nearly ripe when I left, and I left instructions to have it sown at once as soon as the heavy rains, which had fallen continuously since the latter end of June, had ceased. My intention was to sow some now and some in the month of February.

DALHOUSIE: *Sept. 2nd.*

LIEUT. COL. J. ELIOT.—I wrote you before regarding the

result of my sowings of wheat, barley, and oats, not a grain of one of them germinated, though sown partly in my garden and partly by a neighbouring zeminder. A few tares or vetches came up, but the season was against them and they withered and died. My sowings of the grass seeds were equally resultless, the turnips generally were good, and I am surprized at this as turnip seed, I should have expected to fail sooner than the cereals.

DAUGSHAI : *Sept. 10th.*

MR. H. COPE.—I must not omit to state that the crop of oats obtained from the seed you sent for our garden, is astonishing, the stems are in many beds more than four feet high, and no sign of any ear. They would be admirable as a green fodder substitute for the green wheat so wastefully cut in the vicinity of most large towns in the Punjab.

UMRITSUR : *Feb'y. 27th.*

CAPT. J. C. HAUGHTON.—A good deal of the seed sent was of kinds not suited to tropical climates, or rather only suited to temperate ones, thus wheat, barley, the grasses, &c. either did not vegetate, or if they did it was only to struggle into life and through it fruitless. On the other hand the Settlement is indebted to the Society for many valuable seeds, the best account of which is the return of produce given in to government for the year 1860, a copy of which I annex for your information. This does not include a very large quantity of European garden seeds distributed to private parties of which I have no account. The climate is rather too damp for European vegetables, on which we have not an adequate return for seed sown.

PORT. BLAIR, *Oct'r. 22nd.*

Report on samples of Cotton from Umritsur, Banda, Gya, Aska and Penang.

TO THE MEMBERS OF THE COTTON COMMITTEE.

GENTLEMEN,—I have the pleasure to circulate, for the favor of your opinion, sundry samples of cotton recently received. The various letters relating to these samples are also placed in the box.

A. H. BLECHYNDEN,
Secy.

METCALFE HALL:

14 Feby. 1862

Nos. 1.-2 A. cotton (clean)	{	Raised at Gya by E. F. Lautour Esq. from imported and acclimatized New Orleans seed.
No. 3-A kupass.		
No. 1-B-from Egyptian seed.	{	Raised at Banda, by H. Dashwood Esq.
No. 2-B-from New Orleans.		
No. 1 C } stock whence deriv-	{	Received from H. Cope Esq.
No. 2 C } ed not mentioned.		
No. 1 D-cleaned and seed.	{	Received from A. Grote Esq. Raised in Penang.
No. 2 D cotton from Per-nambuco stock.		
No. 1-E. stock unknown perhaps from Tinnevely seed.	{	Received from F. R. Minchin Esq. raised at Aska and Berhamore respectively.
No. 2 E-Ditto-perhaps from New Orleans seed.		

From Messrs Gillanders Arbuthnot & Co. dated Calcutta, 21 December, 1861.

We send you herewith three samples of New Orleans cotton grown by Mr. E. F. Lautour at Gya to which reference is made in the accompanying letter to Mr Stewart.

We shall feel obliged by your examining the samples and reporting upon their value &c. returning Mr. Lautour's note when done with.

Extract from Mr. Lautour's letter.

I send you a specimen of cotton grown by me at Gya from acclimated New Orleans cotton seed and I think you will agree with me that N. O. cotton can be grown in the Gya district profitably. The seed was picked from the cotton I sent you last year, which you reported a fair specimen. The secret is to sow in the beginning of June in order that the crop may have the benefit of the rains. Indian corn should be sown in every alternate ridge to protect the young plants from the fierce sun of June, July and August.

My experience leads me to believe the crop does not require irrigating as it has the benefit of the rainy season and the ground retains its moisture to December and January. The best cotton is by that time gathered; the cotton picked in March, April and May is coarse and not adapted for the English market, but it would sell very well in the Bazar.

The soil this cotton was grown on was the poorest in the garden selected by me *purposely*. There are large tracts of country in the Southern pargannahs of the Gya district admirably suited for its cultivation.

I see much published about the cotton cultivation in Behar; but none can report on it properly unless he experiment, on its cultivation, as I have done. The secret is to sow in June, and shade the plants, by cultivating some high crop along with it; but the Indian corn should be sown very sparingly, otherwise it would choke the plants.

Specimen No. 1.—Cotton grown at Gya from New Orleans seed in 1860. 3rd. pickings in March and April. The cotton pulled in Sept. and Oct. 1860 was favorably reported on.

If this cotton is worth 5 pence to 6 pence a pound cotton may be grown at Gya with advantage to the farmer.

Specimen 2.—Cotton grown from the acclimated seed saved from specimen No. 1. This cotton was gathered in Oct. and the bolls suffered from the excessive rain of Sept.

The bolls had commenced to produce cotton, but as I left Gya I could not secure the entire crop. If this cotton is worth 7 pence or 8 pence Gya, particularly the southern Purgunnahs, will give you as much cotton as you like. The crop will also pay the ryots well, but the seed must be put into the ground not later than the end of July.

Extract of a letter from HENRY DASHWOOD Esq, Camp Pijulee, Banda District, dated 15 Feb. 1862.

Some days ago I sent off to your address two bags containing specimens of New Orleans and Egyptian cotton grown in mine and the Company's Garden at this station. I shall be much obliged if you will let me know whether the produce is approved of.

In August 1860 I received from Govt. a barrel of New Orleans seed on behalf of the Cotton Supply Association for distribution to the Zemindars in this district. By that time it was too late to sow it, so I was obliged to defer the experiment till last year, when I distributed the seeds to respectable Zemindars in different parts of the district. They sowed it on the first fall of rain in June but the seed entirely failed to germinate. I attribute this solely to the seed being too old, for Messrs. Cantor and Co. sent me some fresh seed of the very same kinds* which I had just time to sow in my own and the Company's Garden and it is the produce of this seed that I have forwarded to you. The plants at first looked stunted and unpromising but eventually bore very well and the cotton so far as I can give an opinion appears good. This seed I had not time to distribute amongst the Zemindars, and besides the quantity that I received was too small for general distribution. Judging from this experiment I think the soil of this district is suited to the American cotton and if I could get some fresh seed I

* Received from the A. and H. Society by whom it was distributed on behalf of the Manchester Supply Association. *Eds.*

shall be happy to undertake its distribution among the landholders in this district and report the result of another experiment.

The Egyptian cotton I am sorry to report very generally failed, but whether from excess of rain or some other cause I cannot exactly say. The Zemindars themselves say that it was injured by too much rain, and from this cause certainly the cotton crop of the district was generally injured. In my own garden, so far as regards abundance of flowers and pods, there was nothing to be desired, but the pods dried up and produced very little cotton. After the rains ceased, I irrigated the field once or twice under the idea that the drying up of the pods was occasioned by want of water, but the result was the same. I cannot therefore report favourably of the Egyptian cotton as respects this district, but as last year's was only a *first* experiment I will not despair of a better result next year.

I have the honor to submit herewith two samples of cotton respectively marked Nos. 1 and 2 and shall be obliged by your submitting same to your Cotton Committee and obtaining their opinion on them.

It may interest your Society to learn that even from the Punjab considerable quantities of cotton have been forwarded to Kurachee for export to England; and if the transport arrangements were at all commensurate to the importance of the route the quantity would have been and continued to be much larger, but the Government boats will only take cotton and wool as measurement goods, as we have as yet no means of receiving them here, and the Oriental Inland Steam Navigation Company ask the enormous sum of 1/8 per maund from Mooltan downwards.

UMRITSUR :

29th January 1862.

HENRY COPE.

Report on the Cultivation of Cotton in Pulo Penang: by

MR. T. G. MITCHELL JR.

Amongst the various classes of native cultivators of the soil cotton is certainly the least esteemed. The reason is obvious, in as much as there is no local demand for it, and the natives can form no idea how many millions of the operatives of the English looms are dependent for their existence upon the supply of this article; and until Government do enlighten and hold out certain encouragements to them it is impossible to expect the agricultural labourers would be induced to turn their attention to the cultivation of cotton.

In framing this Report I am entirely guided by my own personal experience, and to this I shall confine myself and adduce such facts as have fallen under my observation regarding the adaptation of the soil, the growth and produce of the plants, and the likelihood of cotton becoming eventually a profitable article of exportation.

Penang is blessed with a mild and salubrious climate. The range of Hills indicates by their luxuriance that vegetation bears the same verdure throughout the year. It is not unusual in passing a native village to see cotton trees flourishing without care or culture, and it is a thousand pities to know that the produce when collected has scarcely even a nominal value; I have myself experienced that as for want of a purchaser in Penang I was glad to give away my produce to those who really needed it when there was none of any sort procurable in the market.

In support of this assertion I beg to append a note of thanks from one of the leading members of our Mercantile community expressive of the sense he entertained of the trifling gift I had sent him when there was none to be purchased in the market.

So far back as 1834 I commenced an experimental cotton garden on my own ground; about 5 acres in extent. The

plants produced cotton eight months from the time I first put the seed in the ground and reaped cotton in quantity far beyond my most sanguine expectation : but, unfortunately for me, there was neither a market, nor a demand for the article then.

On this occasion I became a serious sufferer in a pecuniary way : I had to give away, as already observed, the cotton to those who required it for domestic purposes !! My attention was subsequently directed to spice cultivation and I abandoned cotton entirely. But since the nutmeg plants have been blighted, I have once more turned my attention to cotton culture, upon a smaller scale however, merely to satisfy myself that if due care were bestowed Penang would shortly become one of the cotton producing countries. I would strongly suggest, that cotton cultivation should be undertaken by the Government in the same manner as spices were originally introduced into the Island. An experienced person who has at heart the growth of cotton here should be appointed to this particular duty, and with about 20 able bodied convicts under him, to commence a plantation of cotton on an extensive scale, which should be bounded by coffee plants. I have named coffee, because I have a garden of it in my own ground. As coffee bears fruit in less than two years, the sale of the produce would in a great measure cover the incidental expenses of the outlay. I have every reason to believe, and none to doubt, that were the Government, to give the lead in developing the capabilities of the soil, the natives and other land owners would, as in the cultivation of spices before noticed, soon turn their attention to the all important subject of cotton culture. There would then not only be a market but a large demand of cotton for exportation

Aska, January 13th 1862. Lat. 19° 36'. N. Long 84° 43'. E.

MY DEAR SIR,—The Editor of the Friend of India sent me

your note of the 26th. ultimo, reporting on the sample of New Orleans Cotton grown in my garden and kindly offering to open correspondence with me.

I have much pleasure in informing you that Govt. have offered me land rent free to try on a larger scale the cultivation of American cotton and I am now about to arrange with certain natives in my neighbourhood to bring some 90 acres into cultivation. Messrs. Binny and Co. have sent me a cask of New Orleans seed and a sack of Egyptian and I am daily expecting a large supply of seed shipped on the *Coldstream* now at Pooree.

I planted at the end of last month a good sized piece of ground with some seed from the cask and sack referred to. The Egyptian is coming up very nicely but none of the Orleans has as yet made its appearance. The weather was very cold and also very dry; perhaps this was the cause of the seeds failing. We are just now having a few showers so I have put down some fresh seeds to-day. I shall be much obliged for any hints you can give me or for any manual you can send relative to the cultivation and general treatment of the Orleans and Egyptian cotton plants. Should they be pruned and how—which is the best season for sowing? My little plot of Orleans Cotton was sown in the early part of July just as the Monsoon commenced. Cotton was picked during Nov. and Dec. and it is now in full flower again although the plants are breaking down with pods. I am sending you to-day by banghy dâk two small samples of cotton, one is from my garden here and the other from a garden in the Cantonment of Berhampore 24 miles nearer the Coast. Will you kindly inform me what cotton it is.

F. R. MINCHIN.

Report by Mr. S. Douglas.

Specimens from E. F. Loutour Esq.—Gyah.

No. 1. Soft in texture, but extremely weak and short in

staple and much stained—it is not a desirable cotton owing to extreme weakness of fibre.

No. 2. Very good color and condition—fair staple and of moderate strength of fibre—a much more desirable cotton than No. 1. and by last accounts from Eug. (January, 1862,) it would probably be worth 9*d.* to 10*d.* per lb. there, under present circumstances of the Liverpool market.

H. Dashwood, Esq.—Banda.

This is an interesting report from Mr. Dashwood; his experience of the drying up of the full formed pod after the rains had ceased, tallies exactly with my own, and would prove I think that the seed should be put into the ground earlier—viz: in May.

1. B. Produce of Egyptian seed. It is soft and silky and of very fair staple, but the fibre is weak and would be liable to knot in spinning. The condition is also bad, otherwise this would be a desirable cotton for the English market.

2. B. This is but a poor specimen of the produce of New Orleans seed. The staple is very short and very weak. The condition is also very objectionable, the cotton being much deteriorated by the many small fragments of the calyx being left in it.

Mr. Mitchell,—Penang.

The sample submitted is one of the poorest specimens I have ever seen of the produce of Pernambuco seed. It is extremely coarse and harsh in texture, the fibre is of good strength however and the staple of fair length. The condition is remarkably good also; and probably by better culture the produce might be improved; this specimen however shows great deterioration from the cotton now grown in Pernambuco, and indeed were it not for the seed which accompanies this Penang specimen, it could never be recognised as having the same origin as the superior cotton known in the Liverpool market as “Pernambuco”

Mr. Cope,—Punjab.

No. 1 C. —Is short in staple, harsh, and poor in every respect, it is considerably inferior to the Banda cotton lately sold here at 14 Rs. per maund (usually worth 9.)

No. 2 C.—Is a better cotton in every respect than No. 1.—and may be worth 2 Rs. per maund more than No. 1.

Mr. R. Minchin,—Aska (Madras.)

No. 1. E. Kupass,—Is apparently the produce of Egyptian, or Sea Island seed, and is of a fair silky fibre and good staple, color fair, rather ashy.

No. 2 E. Kupass.—Of New Orleans seed, a very good specimen, and if cleaned would be a desirable cotton.

Calcutta, Feb. 25th 1862.

Report by Mr. W. Haworth.—I consider this specimen

No 1 A Raised by E
F. Lautoir from acclimatized New Orleans
seed at Gya.

shorter in staple than the ordinary run of Orleans, weak, soft, color fair but stained, it somewhat resembles "Bombay Comereerratty" but it is much cleaner. I value it at 8d. to 8½d. in England, January, 1862.

This is good staple of fair strength, rather harsh, well cleaned, good color, and in every respect a quality that would meet with a good demand at home, worth about 12d in January 1862.

The same as No. 2 with seeds attached, the latter is fine bold and good conditioned, promising well for another crop.

No. 3 A, ditto.

Rather uneven in staple, on the whole fair length, very soft and silky, but weak fibre, rather knotty, the color and condition inferior from not being gathered as soon as the pods open.

No. 1 B raised at
Banda by H. Dashwood
from Egyptian seed.

Short, soft and very weak, uneven staple, carelessly picked and cleaned, it does not bear much resemblance to New Orleans.

No. 2 B from New
Orleans seed.

No. 1 C (Stock not named) from H. Cope, Punjab. Exceedingly short and harsh staple, fair color, but not adapted for spinning purposes.

In most respects this sample is like the Banda cotton, it is very uneven but a fair length of staple, good color and clean, and it would sell on a par with Banda.

This is very unlike the ordinary Pernambuco, staple *long*, coarse, strong, uneven and harsh, color *very good* and clean; it is a cotton that would spin well and could be consumed in large quantities for heavy goods; it is difficult to value it, but I think it would have brought 10d. in January, 1862.

The same as the above with seed attached; the latter has all the characteristics of the true Pernambuco.

D 2 the same with seed attached.

I think this specimen must be from Egyptian seed, in point of length and strength of staple somewhat deteriorated as compared with ordinary Egyptian, it is a soft, silky and fair staple, good color, but the seed is not so large and well matured as Egyptian.

This is evidently from New Orleans seed, fair, clean, rather short staple for this description and easily separated from the seed.

No. 2 E. as above likely from New Orleans seed.

Report by Mr. W. S. Fitzwilliam.—A very poor quality cotton, and weak in fibre—would spin badly.

No. 1 A from E. F. Lantour, Esq. Gya Good fair cotton, color and staple far superior to No. 1, but would not suit English spinners.

Not a desirable cotton for the English market, would spin badly in its present condition. If produced from Egyptian seed it must have deteriorated from want of care as to soil and cultivation.

No. 1 B. H. Dashwood Esq. Banda.

A very poor quality, has no doubt suffered from the same
No. 2 B causes which affected No. 1.

A good staple rather coarse fibre but would spin well for
No. 1 D Mr. Mitchell. low numbers, could be much improved
Penang. by attention to soil and cultivation.
No. 2 Ditto, ditto.

No. 1 C Mr. Cope, Very poor and quite unfit for machine
Punjaub. spinning.

Is a better quality both as regards fibre and cleanli-
No. 2 C. ness, but could not find ready buyers
in Europe.

A very excellent specimen both as regards staple and
No. 1 E Mr. Minchin, color, and would find a ready market
Madras Coast. in Liverpool.

This is also a good quality and would rank with fair New
No. 2 E. Orleans in the home market.

In the whole of the samples there appears to have been a
want of care as regards cleaning and picking.

The Penang sample is less so than the others.
10th March, 1862.

A few remarks on Steam Irrigation : by A. G.

MURRAY, Esq. C. E.

Since I last wrote you on the subject of irrigation by
artificial means, I have made further enquiries. In con-
versing with planters I have been struck with the extraordi-
nary want of definite information on this subject, none of
them knew the exact size of a Govt. beegah in English
measure in its relation to the Imperial acre. A Govt. bee-
gah N. W. P. is contained in a square having sides of 160
feet Imperial measure and therefore contains 25,600 super-
ficial feet and an imperial acre contains 48,560 superficial
feet, therefore a beegah, is a fraction over six tenths of an
acre. Besides this Govt. beegah, there is what is called
the kutcha beegah, which is one third of a Govt. beegah

and contains 8,533 superficial feet, this is the beegah the ryots up here talk of in all their calculations; I do not know the origin of this measure.

The wells here (Doab) have their water forty feet from the surface and I find from repeated observation that two pair of men will water one kutchra beegah (8,533 ft.) in a day of wheat, this watering has to be repeated five times at intervals of 12 to 15 days, consequently two pair of men can undertake the watering of three and a half acres of wheat. And it is no use for a man having only 2 pair of men to sow any more wheat as he cannot water it unless he keeps more men.

Now putting the value of the labour of the men at only Rs. 75 for the season it follows that mere watering costs per acre Rs. 21-8-0. This appears a most fabulous sum and to the best of my knowledge no one is aware of the great expense of irrigation by men; the reason is that the expenditure is not made in cash, but really costs this or more, because in order to take up the irrigation, the farmer has to grow fodder to feed his cattle, and I find that when a man has to draw his irrigation water from wells he has to double his stock of oxen to get through the work, therefore it is plain that if the farmer can get irrigation without men he can double his area of wheat or other marketable produce as oil seeds, cotton, indigo, &c. without paying any more ground rent. Having sold half his working oxen, he only needs to provide half the fodder, so that if a man had 100 acres of land under the present system he has 66 acres under fodder with a small mixture of cotton and indigo and only 34 acres under wheat and barley. Now as cotton, indigo, wheat and barley are the real marketable produce which pay the rent and taxes, it is obvious that it is the farmer's advantage to reduce his stock of bullocks to the lowest number. Under a system of artificial irrigation the farmer would have 33 acres fodder, 33 acres cotton or indigo, and

34 acres wheat or barley. You will now I trust see 'the immense importance of some method of irrigation independent of oxen. In my former letter of Sept. 2nd 1861,* I showed you that the Ganges and Jumna canals only provide for a small part of the Doab and that they never can do more than at present; in addition the Ganges Canal is always out of order in the rains. I went to Hurdwar last December to see the canal head and I am sorry to say that I do not think that a masonry dam strong enough to stand the rain floods could be made for any reasonable sum of money. I suspect it would cost some enormous amount. Of course every thing can be done with money, see Portland and Holyhead breakwaters, but I do not think this dam would ever pay the interest on its cost, and it is manifestly unfair to lay a charge on the Imperial revenues for the benefit of a district which never can be much larger than at present irrigated, as the size of the canal bed limits its delivery of water, and as the canal does now absorb the whole visible river as soon as the annual dam is made in September.

We are thus compelled to go back to the wells. In the upper part of the Doab and Rohilkund water is found at twenty feet from the surface; as you go down the Doab the depth gradually increases, but the area of the lower Doab is small. About Hatrass where the Doab is wide and fertile water is found at thirty feet from the surface; in the famine year the water fell six feet in the wells. The superficial strata of the Doab are peculiar and are very favourable for wells, the country is covered with wells, in fertile parts there is a well to every four or five acres, these are however only kutchha wells sunk ten or twelve feet into the sand and lined with brushwood, they give as much water as two yoke of men can draw i. e. about eighteen hundred cubic feet per day; a well is made for Rs. 4 or so and each squatter on 4 or 5 acres

makes one for himself. I cannot see that the water level is at all affected by any number of cattle drawing at the present number of wells, i. e. the supply in a well is not affected by other wells working near it. The brickwork and masonry wells made by planters and wealthy natives when done in the best style do not get the water from the upper sand bed, as in the kutchha wells, but are sunk right through this sand bed into a bed of hard clay, the upper sand is carefully sheet piled out by a wooden lining driven into the clay and packed with puddle, and a hole is bored through the clay to a lower bed of sand, the water from this sand bed is very good and the supply is apparently unlimited. When ten or twelve yoke of oxen are set to work it the water is reduced eight feet, but no power that is available at present can dry these wells, and as many thousands of wells are working simultaneously all over the Doab I see no practicable limit to the water supply. Upon the subject of the water bearing sand beds of the Doab further information is desirable, this can only be got by an artesian boring several hundred feet deep; to the best of my knowledge this has never been done; in my opinion it should be tried; it is impossible to foretell what may be found 500 feet down; as far as we now know the Doab is alternate beds of clay and sand, this is the most favourable case for wells; these sand beds are full of water, and I really think it not at all improbable that by a deep boring a still better and stronger spring might be tapped, which would raise the water in the bore pipe nearer or perhaps up to the surface. I am also engaged in perfecting a portable steam engine for irrigation purposes, but the approaching opening of the railways prevents my attending much to it at present. When I have perfected this portable irrigation steam engine, I will submit it to the Society. I may however say that several planters who have seen my rough plans very much approve of them and say that they will afford the means of systematic and regular cultivation which at present

is impracticable from the enormous expense of irrigation by oxen.

In the mean time permit me to warn landholders against buying English pumps worked by four or six men. English makers have not the least idea of the quantity of water needed here, and advertise irrigation pumps for India: these pumps are really fitted for domestic purposes as baths, stables and such like, but an estate of one thousand acres here, should have as much water as is allowed in England for a town of fourteen thousand inhabitants, if systematic high farming is to be carried out. People in England also fancy that in India there is an unlimited supply of labour and that men and women can be had for a trifle; this, as you are aware, is entirely wrong, and when the very small quantity of work done by men or women here is taken into account, their labour is by no means cheap, and as every one knows is not to be had at all at the most important season. You will observe that steam irrigation is the only method of getting over the difficulty of procuring land for growing cotton and indigo. The steam engine by taking the place of half the working men will clear so much land from cattle fodder crops, which can then be planted with cotton or indigo. As I dare say you are aware there is a considerable difficulty in getting land for indigo, and nobody up here will have any thing to do with cotton; the reason is simply this, that two thirds of the land is needed to raise fodder for the oxen to water the wheat, and as the people naturally look on the wheat crops as the most important, large areas of land for cotton and indigo can never be had unless coals are substituted as a source of power instead oxen. This land difficulty cannot be got over by going into the Central Provinces, as there is no labour there and no means of transit; and from the description given in the late Govt report of the Godaverri I do not think that river is ever likely to be of any use; firstly because the head of the proposed navigation is two hundred miles from the fertile dis-

tricts, and secondly because there are four waterfalls in the river at each of which goods will have to be shifted.

AGRA: *March, 1862.*

Report on the sowing of Exotic Cotton seed distributed during 1861.

[In the middle of 1861 the Society received from the local agents of the Manchester Supply Association a quantity of exotic cotton seed—viz—eight maunds of Sea Island, sixty maunds of new Orleans and seventy maunds of Egyptian. This was distributed to 185 applicants. At the close of the year a circular letter was addressed to about 60 of these applicants who had received the largest quantity, requesting them to state the result of their sowings, whether the seed had germinated well or otherwise: and to explain, in the event of failure, the method of sowing adopted, and any other particulars connected therewith which they might think likely to prove useful. The following are the communications which have been received in reply to the circular.]

FUTTYGHUR.

In reply to your favor of the 6th inst, I beg to submit for the information of the Council of the A. and H. Society the followings:—

Early in May last, I had my land well prepared, and about the 20th of the same month, I sowed my seed on small ridges, and at a distance of 3 feet apart. Of the two sorts of seed I sowed, “New Orleans” and “Egyptian,” both kinds came up beautifully, but the Egyptian on account of its being on low ground, got soon covered with water, and died away. I had great difficulty to preserve the New Orleans and only succeeded partly. I attribute the drawback, to too much rain in the beginning, and a little too, to want of experience.

When Mr. P. Saunders inspected my crop, he found the plants very unhealthy, and attributed the cause to the ground which had not been sufficiently hoed.

At his suggestion, I had the whole plantation well hoed, and in less than a fortnight I reaped great advantages from it.

My plants soon got up to 5 feet high and flowered.

I have no doubt my Egyptian plants would have had equal chance, had they not been destroyed in the beginning by inundation.

My produce however is very small, owing to worms finding their way to the pods and causing a great quantity of them to drop off before being full grown. Notwithstanding, I shall be able to send you soon, a good sample of the cotton and trust the same will meet your approval.

F. C. BRIANT.

16th, Decr. 1861.

ETAWAH : CAMP DIBBIAPOOR.

Your letter of the 6th received. In reply I have to inform you that the New Orleans and Egyptian cotton seed came to hand, but too late for sowing as it was detained in Mynpoorie for a considerable time. The seed has been kept carefully in a dry place, so please kindly inform me if it will do for sowing next May, I am almost glad that I did not distribute it to the Zemindars in the Etawah and Cawnpore districts as I hear that the New Orleans seed did not germinate well and I think it would have had a bad effect if the first sowing had turned out a failure. The native cotton plant in these two districts has been very stunted this year from too much water. I will get some new seed next year and see how it will turn out. I had a very small quantity of Pernambuco seed supplied me by my Superintendent Captain Whish which I had sown. I shall be most happy to give you particulars if you so wish it.

EDWARD S. WOOD Lt.

Decr. 22nd, 1861.

Dy. Supt. 5th D. G. Canal.

MYNPOORY.

I have the pleasure to acknowledge receipt of your circular letter of the 6th ultimo requesting me to state the result of my sowing of the cotton seed furnished to me by the Society, and in the event of a failure, to explain the method of sowing adopted.

The first supply of seed which I had applied for through Messrs Mosely and Hurst, Agents Cotton Supply Association, did not reach me till the end of June, and was sown by myself and other parties to whom I had distributed it in the following manner :—

In anticipation of the supply I had, with the first fall of rain, caused the ground to be prepared by three and four ploughings, and all weeds and roots of previous crops having been carefully removed, it was cast into ridges from 3 to 4 feet apart, and 4 to 6 seeds put

in each hole at a depth of between 1 and 2 inches, and at a distance of 3 feet. The same method was at my recommendation observed by other zemindars in the neighbourhood of my factory, but the result as I have already reported, was a perfect failure, not a single seedling made its appearance, and the seed on being dug out was found to have rotten. The remaining portion of the supply was accordingly subjected to various tests. The native zemindars resorted to their old method of besmearing the seed with dung, and one of my fellow experimentalists, a planter, caused it to be steamed in blankets which had been steeped in warm water (a common way of trying Indigo seed in Bengal) but I am not aware of any seed having been boiled or steeped in hot water to which the failures on their parts are ascribed by Mr. Patterson Saunders. Not one of these experiments succeeded, and determined to satisfy myself and to remove the native impression that the soil was not agreeable to exotic seed, I applied for and obtained a small quantity of Egyptian seed by *dāk bhanghy*. The seed however arrived somewhat late in the season and was sown in the manner above described.

The result I am glad to say has been perfectly successful. Every seed germinated, but not more than one seedling was allowed to remain in each hole. The bolls have made their appearance on the larger plants; but, in consequence of the extreme cold and severe frost which has destroyed more than half the number, they have not opened as yet.

The plants moreover present a stunted appearance which may be ascribed to the same reason, and are a favorite food for white ants. All our apprehensions have been removed, and I have no doubt that, if means existed of obtaining a sufficient quantity of exotic seed, it would be invariably preferred by the native agriculturist to indigenous seed.

The delay in answering your letter occurred by my absence from the station, and will I trust be excused.

W. MARTIN.

31st January, 1862.

SHAJEHANPORE.

By *dāk bhanghy*, I am sending you samples of cotton of this season's growth. No. 1 is from N. O. seed imported this year.

No. 2 from N. O. acclimated seed and sown in May last. No. 3 from N. O. plants now $1\frac{1}{2}$ years old produced from acclimated seed, and giving a third crop. All have been ginned by the native churkee. I could send sample of Egyptian too but believe that it is not such as you would like to pass an opinion on, as it is taken from shrivled and unripe seeds, and could hardly be considered a fair sample of what the plant may produce in this district.

The N. O. seed you forwarded gave weak plants at first but as they sprung up they strengthened, and they are now hardy and vary in height from $2\frac{1}{2}$ to 5 feet according as the seed was sown earlier or later, the early sowing giving the finest plants. Since the rains these have been producing a fair amount of cotton and I am picking daily. This seed was sown not earlier than 15th June and some as late as 10th August.

Some of the N. O. acclimated seed which I obtained in April last from the then one year old plants in the garden were sown in May and these have given most satisfactory returns insomuch that each plant has yielded some 200 bolls already and are now so laden that the branches trail on the ground. This seed was sown in the garden and afterwards transplanted to a sloping plot where potatoes were grown last season. The plants $1\frac{1}{2}$ years old, now giving a third crop, are yielding abundantly also.

The Egyptian seed sprouted up strong for a foot or more and then became weak, and every heavy fall of rain seemed to give them a check and to injure the leaves and young shoots, insomuch that they withered soon afterwards. The last heavy rain which lasted for 12 hours washed the earth from the collerets of rootlets just under the surface and checked the growth for three weeks; they have recovered somewhat since, and have been blossoming and have produced bolls in some abundance but imperfect or unripe ones. I am hoping that they will live over the frost and produce a good crop of cotton during the spring.

From the newly imported N. O. seed I shall have up to the 15th January about $\frac{2}{3}$ of a maund of cotton per acre, and if the yield from it had been the same as that from the plants produced from the acclimated seed sown in May the return would not have

been less than $2\frac{1}{2}$ mds. per acre. The total area is 7 acres of N. O. and 10 acres of Egyptian.

I am having the seed cotton ginned by native churkee because it does not injure the fibre so much as Dunlop's and the difference of expense in working the two is not considerable. With Dunlop's gin I cannot clean, and do the work well, more than 6 or 7 seers in 10 hours, and with a native churkee $2\frac{1}{2}$ seers can be turned out. The expense of working the former is 4 annas per day that of the latter 2 annas and the saving caused by the fibre being left entire I have supposed quite compensates for the loss in value of labor.

The expense to me per acre has been something like rupees 20, but I knew nothing at first of the cultivation and have spent a great deal more than I should find it necessary to do now. My impression is that from 12 rupces to 15 rupees should cover all expenses of cultivating and watering. Picking to be considered separately and for that my arrangement is to give 1 seer in 16 of seed cotton or the equivalent value in cash.

I have found the plant to grow well in all soils excepting very sandy and tenacious kankury, and that the best is a rich mould. Those in sloping ground this last season have thriven best, and where the land was flat I found it necessary to make drains to carry off the water quickly.

The more the soil is pulverized the better the crop, and I believe that all growers of cotton would find it advantageous to pay for digging 2 spades deep should he not be able to employ a deep trenching plough, but I do not think that the hoe should be used very frequently especially in sloping ground—because as the rains are so heavy the loosened soil becomes washed away leaving the collars of small rootlets bare.

The proper month for sowing the seed in this district seems to be May, and as rain seldom falls at that time it will be necessary to raise the plants first in some patches of ground sheltered and near to wells and afterwards to transplant to the fields. This can be done successfully as I have learnt from experience this year.

There seems to be no reason for doubting but that the N. O. cotton plant in this country will yield most abundantly the 2nd season and a cotton not much inferior to that yielded the first, and

far superior to that produced by natives from the indigenous plant, and this is a fact which will weigh well with the natives and make them take to the growing of it.

With reference to irrigation there is one method which I have adopted to some extent this season and which seems to be economical, it is that of irrigating by means of a hose fed by water casks carried on carts. The advantage is that the casks can be filled from small wells, and from the cotton plants being in lines the hose can be readily carried down, and by having it in parts it can be shortened or increased as required.

The seed I have shall be distributed to the Natives about, and I shall be most happy to send and give so much as there may be to spare to any applicants from a distance.

The cotton will be baled as well as it can be done without the aid of a regular screw, and I will forward it to the Agent or Secretary of the Association for shipment to England, the quantity will be very small, but it will be satisfactory to me to know the real market value, and I hope that he will be kind enough to receive it.

December 17th, 1861.

JOHN POWELL.

BANDA.

[*Mr. H. Davidson's letter from Banda, and the report of the Committee on the samples which he has sent, will be found at pages 199, 200, 204—206.*]

FYZABAD.

In reply to your letter dated 6th instant inquiring the result of the sowings of the cotton seed you furnished me with a few months ago I regret to have to inform you that the seed reached me in a damaged state and must apparently have been in this state when it left Calcutta. The seed was distributed to a dozen or more landholders and sown by them in various methods with the same result—total failure in every case.

I attribute the failure entirely to the state of the seed. A small quantity of American seed subsequently obtained from another quarter germinated well, though treated exactly the same way as the other.

That cotton will grow fairly in this Province I have not the slightest doubt but whether it will ever prove as remunerative as other crops is a problem yet to be solved.

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It is perhaps superfluous to observe that the supply of such seed is a great discouragement to the cultivation of cotton.

J. REID.

OUDE :

Dept. Commr.

24th December, 1861.

OUDE.

SIR,—I received your favor of the 6th Inst. stating that you were directed by the Council of the A. and H. Society to request me to inform them of the result of my sowings of the cotton seed recently furnished to me by the Society, &c. &c.

In answer I beg to say that the white seeds lately furnished proved quite a failure not in my estate only but every where—As regards the other seeds those sown in June had not sufficient warmth in October to blossom and consequently became rotten and even filled with small insects, those sown in July have not as yet blossomed, neither is there any hope of their being useful as the weather is too cold; those sown in November will blossom in March next and then I would be able to give you a report of them.

AJOODHYA :

MAHARAJAH MAN SINGH BAHADUR.

16th December, 1861.

ROY BAREILLY, OUDE.

In answer to your printed communication dated 6th. ulto. regarding the result of the sowing of the cotton seed furnished by the Society, may I beg to remark that the seed was sown in the commencement of June last in the lands belonging to 12 different villages situated in the immediate neighbourhood of Roy Bareilly. The sowing covered a beegah of ground in each village. The seed germinated well but the plants died off before even it had attained the height of 12 or 13 inches

Every precaution was taken to ensure success, and all the instructions contained in the pamphlet issued on the subject by the Society strictly followed out. I attribute the failure not only to the nature of the ground which appears little adapted for the cultivation of cotton but also to the excessive and unusually prolonged rains.

A portion of the seed was also sown in my own private garden but with very partial success. The plant is poor and scanty. I have the pleasure of forwarding a sample of the produce. The cotton

Pods have been also much injured by insects. I have enclosed sample of an injured pod.

I shall again during the ensuing year make a trial. I must also state that I shall allow the plants in my garden to remain during the next year, in the hope that they may throw out a better produce. They are as yet but small and stunted—although the ground was well manured and copiously irrigated.

ALEX. P. ORR. BREVET MAJOR.

9th January, 1862.

Oude.

From CHARLES CURRIE ESQUIRE.

Secy. to Chief Commr. Oudh.

SIR,—With reference to your letter, dated 6th December last, From Secy. A. and H. Society Oudh. I have the honor to forward the reports noted in the margin regarding the Experimental cotton cultivation in Oudh.

" Dpt. Commr. Baraitch.

" " Mohundes.

" " Pertabghur.

" " Fyzabad.

" " Roy Bareilly.

" " Sultanpore.

" " Condah.

" " Hurdui.

" " Lucknow.

" Asst. Commr. Oonao.

" Dpt. Commr. Durrabad, with a sample of cotton.

LUCKNOW: Dated 20th March, 1862.

•LUCKNOW.

From THE SECTY. A. H. SOCIETY OF OUDE.

Sir—I have the honor to forward herewith the desired report on Cotton cultivation. It has been ready sometime, but for want of a native machine for ginning some of the cotton produced, and intended as samples, I had not sent it.

13th Feb. 1862.

Report on some New Orleans and Egyptian Cotton seed furnished by Government for an experimental cultivation in Lucknow.

About the end of May last I received a quantity of New Orleans cotton seed from the Secretary to the Chief Commissioner of Oude, and a smaller quantity of Egyptian and New Orleans seed from the Deputy Commissioner of Lucknow, all of which I sowed in several plots in the Badshabagh. Of the New Orleans seed about *one* in a thousand only *germinated*, and on the contrary of the Egyptian about one in a thousand only *failed*.

I sowed a portion of each on trenched and manured ground, and a portion on untrenched ground without manure. The former has decidedly a beneficial effect, the plants on it of both kinds growing more rapidly and more luxuriantly than on the latter.* Cotton plants do not bear transplantation. They take a long time to recover from the injury done to their roots by being transplanted, and they remain stunted. The plants that remained untouched, both New Orleans and Egyptian, have grown very well. In twelve weeks from the time of sowing both kinds began to flower, and in two weeks later they were becoming laden with pods. On the trenched ground the former being 4½ feet high and 3 feet across, and the latter, 5 feet high and 4 feet across, all the plants were irrigated about two or three times at intervals before the regular heavy rains fell. They have produced a very satisfactory number of pods. The New Orleans cotton produced large pods with 4 valves and on the best plants a good proportion, with 5 valves. The Egyptian have produced much smaller pods and almost all with 3 valves. But owing probably to the very unusual amount of rain that fell last year, a vast number of insects of all kinds were generated and the pods, more especially those of the Egyptian cotton, were to a very large extent destroyed by the ravages of a small red maggot which eats its way, through the external covering of the pod, into the seeds and more or less destroys it. So that last year's experiment cannot be fairly taken as a criterion of the capabilities of the Lucknow soil for growing

In order to make the experiment more complete I sowed a plot with native Cotton observing the same rules to which I adhered in sowing the foreign Cotton

cotton. One thing I am sure of having proved, and that is, provided the soil be light and the ground well loosened to a good depth, the healthy growth of the foreign cotton plants is not at all endangered by any amount of water that one may chose to give them, or the clouds pour upon them. During the last wet season in Oudh there was such a fall of rain as has not been known for years, and all the plots of ground in which I sowed the seed are from 18 inches to 2ft. lower than the level of the surrounding ground with no outlet for the water, so that after each heavy fall of rain all the plots were swamped. Nevertheless, even on the ground which was *not* trenched, I did not lose more than one plant—which was one of those that had been transplanted.

It is impossible for me to give even the faintest idea of the proportion of staple, per *beegha*, which either the New Orleans or Egyptian have yielded, because the proportion of pods that have been spoilt by insects is so great, that I should not be far wrong in saying that scarcely any sound pods were collected, but almost all were attacked by the maggots before mentioned. This may have been caused by too much rain, and by a number of trees and hedges which surround the plots used for my experiments, and which may have harboured insects. Whether circumstances different from or the reverse of the foregoing, would produce more favorable results, can only be determined by further experiments. This year from the experience I have gained by last year's experiment, if I were to sow cotton, whether foreign or native, I would proceed as follows: although cotton likes a light soil, I think a light mixture of clay would be an improvement. After ploughing up the whole ground well, I would dig parallel trenches, 18 inches wide and 18 inches deep, and $3\frac{1}{2}$ feet apart. The cotton plant being tap-rooted requires the soil to be loosened more in depth than in horizontal extension, and the above method would save the labor of trenching *all* the ground. I would fill in the trenches with a mixture of equal parts of rotted manure and earth, water the trenches one day, and sow the cotton seed the next 3 ft. apart by rows of threes in a line in the middle of the filled trench.* The extra earth may be left on each

* And thin the plants by degrees, until only one is left where two or three had been sown.

side of the line to guide the water during irrigation and for the purpose of earthing up the plants, should heavy rain and wind knock them down. I would sow three weeks or a month before the setting in of the regular rains, and irrigate at intervals until the rain falls so that the cotton may be a good size before the wet weather commences. By this method, the plants being advanced in growth, will get the full benefit of the rains, will grow rapidly and flower early. While young they should be weeded at intervals.

It would be desirable to sow cotton on ground that can be easily irrigated because, as light soils are adapted to it, the crops would probably fail, in seasons in which a sufficiency of rain did not fall, or where it fell at long intervals, unless it could be irrigated whenever required. And if it were sown in retentive soils, it might be spoilt by a more than usual fall of rain. But with regard to these two circumstances, I have not had the opportunity yet of performing a sufficient number of experiments to warrant my giving a decided opinion. There will be a great many difficulties to contend with in growing foreign cottons or even good native cottons, and one of the greatest will be that natives can grow with less trouble other crops that pay better. For the growth of cotton, in order to obtain good results, requires labor in preparing the ground. I have no doubt that a great deal can be done by improving the native cotton, and with a moderate preparation of the soil, in two or three years very good results might be obtained, both with regard to quantity and quality of staple. For improving the native cotton, I think the following rules might be useful. I would sow as I said before for foreign cotton. But in collecting the ripe pods, I would take for seed from the trees that bear the largest and most fruit, and I would keep separately all those that have four valves (three valves being the generality of the native cotton pods) and sow them separately and devote more care to their cultivation. Any pods that might have a finer and longer fibre I would also keep separate. So that by repeating this process for 3 or 4 years good qualities may be accumulated, and excellent results may be obtained. In order to obtain as much information as I could, from this first experiment in growing foreign cotton, I took some pains in trying to effect a cross between the

foreign and the native, with a view of amalgamating if possible the hardness of the native plant with the quality of fibre of the other.

Professional men in Europe sometimes produce wonderful effects in flowers, fruits, and vegetables by hybridization, and some unexpectedly good results may possibly be produced also by crossing the various cottons. It may not be possible, but even the facts of its impossibility would, if proved, be worth knowing. I should not consider such a thing impossible until I had performed the experiment from 5 to 100 times carefully and under the most favorable considerations upon each species reciprocally and failed. It may perhaps be of some use to state the mode in which I performed the experiments. I was obliged to operate in the open air for want of a green house. The best time for these experiments is early in the morning before the anthers have burst. From the flower to be operated on, I separated the unburst anthers with a small scissors and shook them all out of the flower. By means of a lens I examined the stigma to assure myself that no pollen grains were on it. I then applied the pollen, (after the anthers had burst) of the flower by which I wished to fertilize, and afterwards tied up the flower, which was acted upon, in a piece of gauze to prevent the access of insects which might transport pollen from other cotton flowers. A label should be appended to the flower, in order to recognize the pod, should it be successfully hybridized. The gauze may be removed in the evening as cotton flowers only last one day. The following is the number of experiments performed :—

I tried six times to fertilize native cotton flowers with pollen of a New Orleans plants, and was each time unsuccessful. The pod grew to a certain extent and then dropped off.

Egyptian on native I tried twice—equally unsuccessful.

Egyptian on New Orleans—once unsuccessful.

New Orleans on Egyptian—twice and both *successful*. The pods of the latter have grown and produced healthy seed. This year I shall be able to prove whether these seeds produce a result of any value or otherwise.

The Egyptian cotton, in my experimental cultivation, has grown under the same circumstances, much more luxuriantly than the New Orleans, and this is the reason for which in the latter experi-

ment I have tried to amalgamate luxuriance (which indicates suitability to soil and climate) with quality of staple. Since performing the above experiment I find that the Agri-Hort. Societies of Western India and of Madras also propose performing experiments in the hybridization of cotton. With a view of making the most of my foreign cotton plants, I intend shortly to prune them, and plant the cuttings in order that I may obtain as much seed as I possibly can this year, for further, more extensive, and more varied experiments in the next.

RECAPITULATION:

The experimental cultivation of last year counts almost as nothing, on account of the ravages committed on the pods of all cottons (not excepting the native) by maggots, the generation of which is more than likely attributable to excess of rain.

The only results I have obtained are the following :—

A considerable amount of healthy acclimatized New Orleans and Egyptian seed for further experiments.

A small quantity of healthy seeds from New Orleans 5 valved pods.

Similar quantity of Egyptian 4 valved pods.

A quantity of seed from 4 valved pods.

The seeds of one very large 4 valved native pod.

The hybridized seeds of two pods of Egyptian cotton. And further I have proved that foreign cotton can be made to grow luxuriantly in Lucknow, and that in a light and loose soil, excess of water does not endanger its healthy growth, but whether a profitable amount of pods, free from injury by maggots, can be obtained from foreign cotton, remains yet to be determined.

E. W. BONAVIA, M. D.

LUCKNOW :

Secy. Agri-Hort Society of Oudh.

18th January, 1862.

N. B. The Sea Island cotton is of no use here. It produces plenty of wood and leaves but no staple.

* * * In a letter of date 15 March, to the address of the Secy. A. and H. Society, Dr. Bonavia writes as follows :—

MY DEAR SIR,—Your parcel of S. African seeds reached all right. I hope I may get them to germinate. By today's dak I

send you some of Foreign Cotton &c. grown in Lucknow as an experiment last year. The samples are as follows.

New Orleans.

- No 1. good bolls.
- No 2. bolls destroyed by maggots.
- No 3. cotton with seed.
- No 4. do without seed.
- No 5. seeds only.

Egyptian.

- No 1. good bolls.
- No 2. bolls destroyed by maggots.
- No 3. cotton with seed.
- No 4. do without seed.
- No 5. seed only.

Native Cotton.

- No 1. cotton with seed.
- No 2. cotton without seed.
- No 3. seeds only.

Almost all the pods, of all the kinds of cotton were damaged last year by maggots which perhaps is attributable to the vast amount of rain, and therefore the cotton is very much discolored. The only pods that were untouched are those in the samples of foreign cotton nos 1. Nos 2. are the worst pods, Nos 3 are staples of the medium bolls but as they were all more or less damaged they are discoloured. It is difficult to separate the seed from the *N. O.* with the native wheel. Nos 5, will show the quality of the seed. I have sent in a report of the experiment to the Chief Com and as I understood that it was intended for your society I have sent you a copy of it.

LUCKNOW :

E. W. BONAVIA.

15, March 1862.

BARAITCH.

From The Deputy Commissioner,

With reference to your No. 1737 of the 23rd May last forwarding, for distribution 8 seers of American cotton seed and 2 seers of Egyptian together with copies of a small pamphlet regarding the cultivation of cotton and requesting a detailed report of the results of the experiment at the end of the season, I regret extremely that

owing to unforeseen and inevitable circumstances I am unable to throw any light from experience, on the capabilities of the Trans-Gogra soil for the cultivation of cotton.

On receipt of the cotton seed it was distributed to the Talookdars Manager of the Kup-poorthulla Estates. Talookdars of Tipraha. Raneepoor. Nanpara. Gungmul. Luchmunkokul. Allynuggur. Reoha. Bhinga, and the Tuhseeldars of Hissampore and Nanpara. and officials marginally noted together with translations of the pamphlet for information and guidance. The list comprises all the large landed proprietors as well as those who appeared to me, either from their tastes or from the fact of the country cotton being sown in many parts of their estate, likely to take any interest in the experiments; and they were particularly enjoined to sow the seed in both high and low land, and especially in those parts of their estates where the tenants have been in the habit of sowing cotton for their private use.

Both kinds of the seed were also largely sown in the Government garden, and every care taken to obtain a good result or to enable us to form an opinion of the capabilities of the soil for the growth of the cotton.

The land in the Government garden is low but considerably lower in some parts than others and the seed was sown in both but in neither was the result fair. In the very low ground where water lay for some hours at a time it was sown on ridges.

Not one of the Talookdars either has been successful. All report that none of the American (or white cotton) seed and some that none of the Egyptian germinated, which they attribute to the rain having fallen immediately after sowing. Others say that plants bore no blossom and a few that the blossoms did not yield much cotton. As regards the American cotton seed the result in the Government and private gardens was the same.

But what was the principal cause of such a general failure? Whether in consequence of the ignorance or indifference of the Talookdars, the excess of this year's rain fall, or the unsuitableness of the soil for the culture of the cotton, I must confess owing to my ignorance of the art, I am unable to give an authoritative

opinion ; but I am inclined to think the American cotton seed must either have been bad or that it is a more tender plant, and that the general failure of the Egyptian is attributable to the rains not only being abundant but falling much earlier than in ordinary seasons, and perhaps that the land had not been properly prepared—as last year notwithstanding the seed being received very late, that sown in the Government garden was very healthy and bore well, as did also a few plants in Lieut. Forbes' garden which was on high ground.

In many parts of this district the country cotton is sown, but generally on high lands and then in company with something else. Its yield is very trifling and its culture only attempted for private use. Traders import their cotton mostly from the North West.

Doubtless Mr. Saunders who passed through the district some days ago will be able to give us a few hints that may be useful to the uninitiated. I regret that I did not see him. If the experiment is to be made again this year I would recommend that the seed be sent earlier, and Mr. Saunders be required to name the portion of the district through which he passed and which seemed to him well suited for the growth of cotton and the reason thereof.

I have had much difficulty in eliciting accounts of their procedure from the Talookdars, and not having had even the experience of the Government garden, in consequence of the almost total failure in it, to aid me, there has been considerable delay.

3rd March, 1862.

MAHOMDEE.

From THE DEPUTY COMMISSIONER.

In reply to your letter of the 23d. May 1861, I have the honor to state that the American cotton seed therein referred to, duly reached this place, and that portions of it were distributed over the district without loss of time. The ground was prepared as directed, in the paper extracted from the eleventh Vol. of the Journal of the Agricultural and Horticultural Society of India.

2nd. Spite of the care inculcated to ensure a satisfactory result, I am sorry to state that our experiments have not been successful. On the 18th May, an unusually early period of the year, the periodical rains commenced, and fell with unabated force over the length and breadth

of the land. Sowings were made, but curious to say but few seeds germinated. The plants that sprung up, seem stunted, and unhealthy, and of a field of extent 1 Beegah and 3 Biswahs more especially under my own eye the produce only amounted to about 16lbs weight. I attribute this failure wholly to having had to make the sowings in very wet weather ; and to not having selected specially high lands—I am the more confirmed in this opinion as I visited Mr. Powell's plantation at Shajehanpore which turned out a fair crop, but there again the sowings were made in early May, before the rains commenced, and an inclined plain was selected for the crop. Without manuring however I am inclined to believe that the soil of this district will never afford a good cotton crop.

18th Febr'y. 1862.

PERTABGURH.

From OFFG. DY. COMM'R.

In reply to your No. 4090 December dated 21st requesting to be informed of the result of the experiments with the cotton seed, I regret to be obliged to state that, having called on all the persons for a report of their success with the seed, I cannot find a single instance in which the seed produced any cotton.

A great deal of the seed did not germinate, and where it did do so, it only grew some 6 or 8 inches, and then died. The result seems to me to shew that the American seed was bad, and that the Egyptian seed was sown too late to thrive; the heavy rain also of the past year was much against the cotton plant.

The 15th Februrary 1862.

FYZABAD.

In reply to your docket No. 4090 dated 21st Decr. 1861, calling for a report of the result of the sowing of the American cotton seed for the information of the Agri: Horti: Society, I have the honor to state as follows:—

2nd. The seed was issued to nineteen landholders with most of whom it was a total failure, partly I believe because the seed was not good to begin with, partly because an excessively heavy fall of rain followed immediately upon its sowing and partly because of the indifference and inattention of the parties themselves.

3rd. Maharaja Man Singh got a large supply of the same seed

for himself, and I got one cask which was issued in good time but I believe the American seed was all bad and it failed totally everywhere. The Maharaja's seed did not reach him till the end of July and the rains might have contributed in some degree to the unfavorable result, but as I have said before I believe the seed was bad when received. The Maharaja has sown some of the Egyptian seed with the Rubee crop on which he promises a report hereafter; at present appearances are favorable; he finds rather damp land best adapted for the plants.

4th. Raja Rustum Shah had the best specimens in the district last year but this year the experiment has been a total failure.

5th. Meer Bagur Hoossain reports that he tried three different kinds of land but owing to the heavy rain the seed failed everywhere, a little came up but did not flower.

6th. The Manager in charge of an estate under direct management reports that all the American seed failed, but that the Egyptian has succeeded pretty well. It was sown at the rate of one seer per beegha, some on level land, some raised, the latter is the better of the two, great care has been taken of the plant, latterly it has been irrigated and the soil loosened once a week but the watering has not been found beneficial.

7th. With Shakoorayan Rughonath Kour the American seed, as elsewhere, failed entirely, but the Egyptian though planted late grew well though planted too late in the season.

8th. The general results of the experiment as far as American seed is concerned have been as unfavorable as possible, all having totally failed in every part of the district.

The result of the sowing of the Egyptian seed has been much more promising but the quantity sown has been much too small to form an accurate test: As above mentioned the Maharaja is making a series of experiments by monthly sowings from Egyptian seed; of the result of which he will make a report. By this mode he will at all events ascertain the most favorable season for sowing which will be very useful in our next year's experiments.

ROY BAREILLY.

From Assistant Commissioner.

With reference to letter from Assistant Secretary to Chief

Commissioner No. 4090 dated 21st December 1861—I have the honor to inform you that the New Orleans seed was planted after the first fall of rain in June 1861. Owing to the constant and heavy falls of rain in June and July very few of the seed germinated and the plants that did come up all died.

2 There was a small quantity of black, well cleaned, seed which I got from the office but where it came from I know not, this germinated and there are now in the public garden 360 plants in a bed 40 feet \times 123 feet. The ground was well ploughed manured and drained. The plants above mentioned have not yet podded; a few flowers only have appeared; they will be kept well cleaned and watered.

Sirdar Golab Sing to whom some of the seeds were sent states that the New Orleans did not germinate; the black seed did, and the plants are still alive.

The 10th January. 1862.

SULTANPORE.

From Deputy Commissioner.

I have the honor to report the result of the sowing of cotton seed supplied from the Chief Commissioner's office, as requested by your docket No. 4090 of the 21st ultimo.

2. The New Orleans and Egyptian seeds were sown in low land on the bank of the Goomtie. This land retains some moisture throughout the year and requires very little irrigation. The very heavy rain coming at an unusually early period of the season, quite flooded the fields and a few only of the American seeds germinated. The Egyptian variety however, has been more successful though its growth was much retarded by the frequent flooding of the fields. The American seed was I think old and these two causes, excessive moisture and age, combined to produce a failure. In some fields there was a second sowing.

3. Many plants of the Egyptian variety, vigorous and healthy, are now in flower. These were plants sown where the slope of the field rendered them less liable to immersion. In other fields, without drainage, the plants are still diminutive and will not probably flower for some time. Frost has blighted a few. Any protection given by trees, or a hedge, from the strong easterly breezes seems to favor

the growth of the plants ; but it is evident that drainage should be provided for.

4. No report has as yet been made by the native landholders to whom seed was given, but I am aware that the sowing of the Egyptian variety has been generally successful. The two years old plants grown from the American seed sown in 1860 have podded, but the staple appears to me shorter and less in bulk than it was the first year. The late rain damaged it.

The 3d Jany 1862.

GONDAH.

From Dept. Commr.

I have now the honor to reply to yours No.4092 dated.21st. ult. and to intimate the despatch to your address of a small packet of cotton grown by myself during the past year and which is the produce of some trees raised from some Sea Island seed sown in 1859.

The specimen has I am very sorry to say been carelessly picked and is therefore very dirty, but the staple is I think good.

2. I also send you in a separate packet 4 pods taken from trees raised from the seed derived from my 1859 plants. It appears to be a little early for the pods to open and therefore these were all that could be procured at the present moment. They are I fear but poor specimens, and will be accounted for by their being the first pods of the season and instead of being picked as directed in the copy of instructions, which I received from the Commissioner of Division, namely just as they are about to open, have been allowed to open fully on the tree and remain there some few days ; moreover the ground had not been manured and had grown Country cotton the year before.

3. With reference to the seed forwarded in July last, this was sown on the 18th. of that month, precisely in the manner laid down in the instructions above referred to. None of the American seed came up, but the Egyptian was far more successful.

4. Some of this latter was sown in a portion of the garden where as in the former instance the year previous some Country cotton had been sown, and although this came up, yet the plants have hardly reached a height of more than 18 inches or 2 feet ; some of

these are in flower and will yield, still the plants are weakly and many are now dying.

5. Some of the seed again was sown about 10 days later in another portion of the garden which had been manured and allowed to be fallow the year previous. These plants have come up very well and reached a height of 6 feet, they are now in full flower and the pods promise very well, they are also however a little weakly and require to be supported with a bamboo frame work to prevent the weight of the pods bearing down the plants and breaking them, and I trust that I shall be able to get the produce of these plants picked carefully. The picking will not however take place for another fortnight.

6. The results then of my experiments have induced me to form the following opinion. That in this portion of the province, with proper manuring and due regard to rotation of crops, the plant can be made to grow as luxuriantly and yield as abundantly as in any part of India. Further that the American seed can be acclimatized and also made to produce abundant crops.

7. However to enable the plant thus to produce abundantly, great care and attention is required in its cultivation, and that at present the natives do not certainly appear disposed to pay. It required, I consider, the presence of some European, whose business and interest it is to promote the cultivation of the plant, to reside in the vicinity, when they can have abundant ocular demonstration of the advantages derivable from the increased attention paid to the subject to induce them to depart from their present routine.

January, 1862 ;

HURDUI.

From THE DEPUTY COMMISSIONER

In reply to your docket No.4090, dated 2nd. January 1862, I have the honor to report that the seeds were duly received and planted, but owing to the very heavy rains this year the land in which the seed was sown was flooded for a long time. The experiment therefore, I regret to add has been a failure.

2. A great portion of the seeds have germinated, but the plants look stunted and unhealthy.

The 7th January, 1862.

LUCKNOW

From DY. COMMISSIONER.

With Secretary Chief Commissioner's letter No. 1737 of 23d May 1861, 8 seers of American and 2 seers of Egyptian cotton seed were received.

Two seers of each were sent to Doctor Bonavia and two seers American to each of Rajah Furzund Allee, Rajah Kasheepershad, and Zemoo lalodeen.

2. I regret to say that it utterly failed, the two latter report that none grew. Rajah Furzund Allee that a few trees came up, but owing to the heavy rain they all died off. It is probable that it was not very well looked after, but that the seed was bad is evident from the experiment at the Sudder and it does appear to be the rule that seed of all kinds sent to this country is deteriorated probably on account of the loss of time in transit.

3. Hardly one in a thousand of the American seed sprouted and although the pods that succeeded were large on account of the great size of the seed, the weight of cotton per pod was not equal to that of the native plant with a much smaller seed nor was its staple generally longer.

4. I believe that the best means of increasing the crop will be the presence of a liberal paying European Agency and the more careful culture of native or hybrid plant.

5. Dr. Bonavia has sent a detailed report direct to the Secretary Chief Commissioner.

LUCKNOW: 31st January, 1862.

OONAO.

From ASSISTANT COMMR.

In reply to your letter No. 1737 dated 23d May 1861 with its enclosures, I have the honor to report on the result of the American and Egyptian cotton seed despatched from the Chief Commissioner's office.

1. With regard to a small quantity of seed sown by myself in the Government Garden Oonao. The land (about 2 biswaha) was well ploughed, manured and watered some four days previous to sowing the seed. Trenches, 5 feet apart were prepared and holes

for receiving the seed $\frac{1}{2}$ inch deep. From 4 to 7 seeds were placed in each hole according as the seed looked full and healthy or otherwise. The holes were made at a distance $2\frac{1}{2}$ feet from each other. Three trenches were sown with New Orleans seed. One trench with Egyptian on the 3rd June 1861. But 5 plants of the *American* seed ever appeared, germinating about the 10th or 11th June. The plants were carefully tended but were of a very sickly appearance and their growth stunted. In about 6 weeks they entirely died off.

The *Egyptian* seed germinated very fairly at an average of 3 seeds to the hole on the 8th June.

Leaving only 1 plant to each hole the remainder were all transplanted to new trenches prepared for them in the manner above described on the 10th. June. These like the *American* after the 3rd. leaf, began to wear a very sickly and unhealthy appearance, and eventually died off without flowering, the growth of all being more or less stunted. Some three or four perfectly strong and of a good colour survived the heavy rains, flowered and yielded 2 or 3 pods of cotton each about the 1st. or 2nd. week in October.

Seed was distributed the first week in June to the undermentioned Talookdars.

Raja Gourishunker of Morawun.

Chowdry Gopal Singh of Bangermow.

Chowdry Doste Ally of Oanao.

Omrao Singh of Gulgulha.

Each planter was also furnished with a correct translation of the directions to aid in the cultivation as forwarded by you.

Raja Gourishunker of Morawun reports that not a single seed of the New Orleans kind germinated, but a few of the *Egyptian* came up, were stunted in growth, a few flowered but none bore pods. Is of opinion that the soil is not suitable to cotton.

Chowdry Gopal Singh of Bangermow reports entire failure of the *American* and but partial success of the *Egyptian*. The latter grew to a certain height, then entirely died off. Attributes the failure to the unusually heavy rains of last year, the country being completely flooded.

Chowdry Doste Ally of Oonao reports total failure of the seed of both kinds sown by him.

Omrao Singh of Gulgulha reports failure of the American seed. A few plants of the Egyptian survived the heavy rains but were cut off by frost.

In conclusion I fear it has been my task to report a total failure of the growth of foreign cotton last year in the Oonao district, but would respectfully venture to suggest a second trial of the experiment this year in the hope that the rains may be more favorable during the ensuing season and that thereby the seed may derive the benefit of a fair trial. The land also should be prepared in February or March as after that time according to the directions it becomes too dry and hard for the plough to penetrate. This was not done last year, and may serve in some measure to account for the entire nongermination of the New Orleans seed which is evidently of a less hardy character than the Egyptian.

OONAO: 11th Febr'y, 1862.

DURIABAD.

From ASSISTANT COMMISSIONER.

1st. The cotton was sown in the Govt. garden, Nawabgunge, towards the end of July, and early in August. It made its appearance in 10 or 12 days—but the inundations caused by the excessively heavy rains of September and October destroyed a great portion of the plants. Besides this, the soil of the neighbourhood is not suitable for the cultivation of the cotton plant. The American seed was a total failure. The Egyptian fared somewhat better, but the larger proportion of the plants having been destroyed by the inundations, caused the yield to be very poor indeed. I send with this a sample of the cotton produced. Of course it is exactly as it came from the bushes.

2nd. The experience of the present attempt convinces me first that, with the soil which we have in this neighbourhood, a large quantity of manure must be mixed before the ground can be at all suitable for cotton cultivation, and, secondly, that in fields well and carefully drained, alone, is there a chance of success. I attribute the total failure of the American seed to the want of draining in the

fields in which it was sown in the Government garden, and the consequent lodging of the water there during the latter rains for nearly a fortnight.

3rd. It is of course impossible, from the result of this experiment, to make any calculation as to what the yield ought to be under favorable circumstances from any given quantity of seed. I may add, that Mr. Saunders, the Cotton Commissioner, when visiting the station, pronounced the soil of the neighbourhood quite unsuitable for cotton.

DURIABAD DIST. *The 27th December, 1861.*

TIRHOOT.

In reply to your letter, I am sorry to inform you that the seed kindly furnished me by the Cotton Supply Association was not received by me in time to sow in consequence of its having been sent to Shergotty instead of to Monghyr, and owing to all communication to the above station being shut up by the severe inundation of last year, it was sent back to Calcutta, and again forwarded after some unnecessary delay. I am keeping it very carefully hoping to sow it at the proper time this year, but I am doubtful whether it will germinate.

I only returned here from Calcutta yesterday; in consequence of my absence your letter was not replied to before.

INHORE FACTORY,
1st. January, 1862.

JAMES WILSON.

SARUN.

With reference to your letter, dated 18th ultimo, I have the honor to inform you that notice was given to all the European Gentlemen residing in this District regarding the distribution of cotton seed for sowing, but only one of them viz. Mr. L. Macdonald of Pertabpore Factory, has applied for and received a seer of each kind of the cotton seed received with your letter of the 17th Sept. last. I have called on him to furnish the requisite information, but as I hear he has gone to Calcutta there will probably be some delay in procuring a reply.

CHUPRAH,
January 4th, 1862.

J. S. SPANKIE.
Deputy Collector in charge.

CHUPRAH.

I have received your letter of the 30th ultimo, addressed to Mr. L. Macdonald asking for information regarding the result of his sowings of "Cotton Supply Association" seed. Mr. Macdonald is himself away at Calcutta, but I have questioned his gardener on the subject, who tells me that the seeds of the first sowing in November germinated very badly, and the few plants that came up died afterwards, after having been transplanted from the ground in which they germinated to other ground. The seeds sown in December came up very well, and had not been transplanted. The plants are now about 8 inches high, but look very sickly, the season I fancy being too cold for them, a few more seeds will be sown this month and so on monthly until the last season for sowing is ascertained.

GAIGHAT,
January 6th, 1862.

I am &c.,
(Sd.) J. MACDONALD.

Memo No. 150 of 1861-62.

Copy forwarded to the Secretary to the Agricultural & Horticultural Society, Metcalfe Hall, Calcutta, for information, in continuation of this office letter, No. 146, dated 4th instant.

SARUN COLLECTOR'S OFFICE:
The 13th January, 1862.

J. S. SPANKIE.
Deputy Collector.

JUGDISPORE, SHAHABAD.

Herewith you have copy of a report received from our Manager Mr. Mylne regarding the cultivation of cotton on the Jugdispore estate.

It indicates the progress made up to date. It indicates the progress made but we can hardly infer any thing conclusive until the crop has been gathered.

We have a "Forbes Dunlop" gin on the way which ought to be here in about a fortnight hence which my brother will show you on its arrival.

CALCUTTA:
7th January, 1862.

WALTER THOMSON.

Jugdispore Cotton Cultivation Report.

Seeds sent to H. Burrows by the A. and H. Society. The seeds were planted in three ways—

1st. By the Koirees or other Native cultivators and in their usual way but at intervals of 6 feet.

2nd. Own planting in holes 12 inches deep and 18 inches square, the holes being first filled in with 5 inches of good manure, into which the seeds were placed, holes 6 feet apart.

3rd. Own planting in pits 4 feet deep and 4 feet dia: filled in with 12 inches deep of good manured soil, into which seeds or seedlings were planted as found most convenient, pits 10 feet apart. The first by the Koirees and native cultivators is an entire failure. Seed for 30 biggahs was given and three rupees per biggah advanced with promise of further assistance as the plant progressed, and the assurance that the produce both in cotton and seeds should be purchased from them at an advance on the market price of the time with prizes for the best out turn. The result of the experiment will not, I think, equal 5 seers of cotton. The land was cleared of Jungle only two years since and therefore is new. It is good opium soil. New Orleans seed did not germinate, and was replaced by Egyptian with the above result.

2nd. Own Cultivation—One patch of this about 5 biggahs is growing in very sandy ground (an old Indigo field) from New Orleans seed planted about the end of June. As many of the seeds did not germinate the planting was continued during July. Plants are now in all the holes, and for their size appear to be bearing very well, having from 10 to 30 large pods on a bush, but the bushes do not look so fresh and healthy as I should like to see them. Though a gentleman who has been in the Carolina Cotton fields and about a month ago looked at the plants said they looked as well as the same plants in America. He remarked that they should have been only 3 feet apart. They now average about 2 feet in height. About 2 biggahs of Egyptian seed were planted in the same place about the beginning of August and though receiving the same treatment are now much higher, the average being not less than 3 feet.

In a patch of newly cleared jungle land during 1½ month from

15th August till the end of September there were planted about 70 biggahs of Egyptian seed. 50 of these look well the average height being about 3 feet and fresher looking than the former. The holes were filled up with good mould as the plant grew, the intention being that the roots should be as far from the hot dry surface as possible, irrigation to any considerable extent being at present impracticable.

3rd. Own cultivation in 4 feet pits. There are say 10 biggahs of this, planted about the end of September and the beginning of October. The plant on the whole looks much fresher and stronger than any on the surface or in the 12 inch holes; the leaves being large full and rigid, with sap. Many of the plants have already grown up out of the pits and are beginning to pod plentifully for their size, what the result will be it is at present impossible to say.

The endeavour is to supersede the necessity of irrigation in light sandy ground while the benefit of irrigation at a minimum cost is in some degree obtained. The pits are filled with good mould or surface parings as the plants grow, and thus far the result is very promising. Plants with roots 4 feet in the ground will probably after cutting away the old wood give vigorous shoots for several years, and thus situated the condition of the plant seems to be as nearly in accordance with its nature as possible, damp and cold below with plenty of sun above. I do not think that the expenses of this mode of cultivation will exceed those of the ordinary method.

(Signed,) JAMES MYLNE,

BEHEEA SHAHABAD:

Agent to H. Burrows.

December 20th, 1861.

Jugdispore Estate.

P. S.—I have seen in several places in the neighbourhood what appears to be Egyptian cotton bearing freely a small pod but good staple and 2 or 3 years old; height 10 or 12 feet.

GYA.

The cotton seed you sent me germinated very well and from experiments made by me I have no doubt the district of Behar will produce very fine cotton. The acclimated New Orleans seed is the best for Behar. I have sent some specimens of cotton from

the New Orleans acclimated seed to Messrs. Gillanders Arbuthnot & Co.* and also to Mr. Beadon, as I should like to see its cultivation encouraged in that district. I also enclose you a sample, but as I left Gya, just as this crop was coming on, I only gathered a small portion; the bulk of the crop from the acclimated seed went to my mālī.

This cotton is from cotton produced in my garden last year. The seed you supplied me with was sown but had not flowered when I left Gya last October. The great secret is to sow in June and to shade your trees from the fierce sun of July, August and Sept.

PATNA: 12-17-61.

E. F. LAUTOUR.

BURHEE.

In reply to yours of the 6th instant received last night I beg to say that the last supply of New Orleans seed that was sent me reached too late in the season to admit of its being extensively sown, a small quantity which I put on ridges germinated to the extent of 75 per cent. The plants are now 2 feet high and in full blossom. The Egyptian seed sown by me on ridges has not succeeded so well as that put in broad cast; this I attribute to the small crust of earth, comparatively speaking, that shelters the roots, compared with the plants that are on level ground and sown broad cast. Wind and rain have also a less injurious effect on plants not on ridges.

11th December, 1861.

C. E. BLECHYNDEN.

BHAUGULPORE.

In reply to your letter of the 18th December last, I have the honor to inform you that the cotton seeds supplied by you for sowing in this District were distributed by me to several zemindars European and Native. Some say that none of the seeds germinated but I cannot get details from them.

Some have reserved the seeds saying that the best time for sowing is after the first spring shower.

BHAUGULPORE:
27th Feby. 1862.

C. B. SKINNER,
Collector.

* Mr. Lautoeur's previous communications and the Committee's report on the cotton will be found at page 198. Eds.

SAHEBGUNGE SEEKREEGULLY.

In reply to yours of the 6th ultimo I beg to say the cotton germinated well in all cases and the plants looked strong and healthy, but unfortunately the very high inundations and hill floods of this year destroyed the crops and every plant perished except about 100 which were much injured; and when the pods were nearly ripe an insect attacked them altogether. I look on my experiment as a failure but I intend to try again as the ryots were well pleased with the prospect of the crops before the water spoiled it.

WM. ECTOR, ORR.

6th January, 1862.

PUTTORGOTTA, COLGONG.

I am duly in receipt of your letter, dated the 6th Decr. and in reply I beg to state for the information of the Cotton Supply Association that the Egyptian cotton seed received by me is thriving well and showing a good quantity of pod although at present none of it is ripe. The seed sown first that is to say that sown about the middle of June last, is the most thriving, I will let you know the result of the produce as soon as the crop is gathered.

None of the New Orleans seed has germinated; this was owing to the seed being in a damaged state when delivered to me; this I have proved by a number of experiments.

I have no doubt that had the seed been good the result would have been equally as good as the Egyptian.

Nearly all the acclimatized New Orleans seed has germinated and is thriving well. I will send you samples of this and the Egyptian Cotton as soon as the crop is gathered.

COLGONG :

January, 11th 1862.

G. MACDONALD.

COLGONG.

In reply to your letter of inquiry of the 6th I am sorry to give an unsatisfactory account of the result of my sowings of the two descriptions of cotton seed furnished to me.

I look upon the late sowing of the seed as one cause of failure, it being put into the ground when the native cotton is upwards of a foot or foot and a half, and therefore planted out of season.

Independent of the above the seed itself was indifferent as you will observe from the small quantity which germinated giving only small beegahs (Bengal) from the liberal supply furnished me.

I cleaned some virgin soil below Pankabaree in the Sikhim Terai, had it well cultivated with my own ploughs, thoroughly cleaned and dug with Kodalees, and expected to reap a good harvest seeing the suitable nature of the soil from rich plants growing adjacent from native seed; but as I said before the quality of the seed was poor and the sowing too late in the year.

I have begged my friend Mr. Scanlan of Darjeeling to send you down by dawk banghy specimens of the two kinds of cotton with any remarks he may be able to make upon the same and the working of the cleaning machanic which I received through Messrs. George Henderson & Co. I believe through the kindness of Messrs. Mosely and Hurst.

I am sorry for the failure of the experiment this year, I shall be happy to give it another trial next year both in the Terai and in valleys within the Hills where the soil is suitable.

COLGONG :

C. H. BARNES.

20th Dec., 1861.

PURNEAH.

In reply to your letter of the 6th Dec., I must apologize for not writing before this but your letter has only reached me after my returning from a journey through the Darjeeling and Rajmahal hills.

I distributed the cotton seed you sent me over a large tract of country and sowed about 50 biggahs myself, but in every case our labour was lost, scarcely a seed germinated, the seed was bad, this has had a bad effect on the people of the country; in the same neighbourhood the acclimated seed thrives very well and is bearing as usual. In future I would advise your Society to make a hole in each of the casks they receive, and taking a handful of seed out of them try their germinating power before they send them up. It is very discouraging to have land prepared &c.—and then to find seed so very bad. Had $\frac{1}{2}$ the number of seeds come up I would not have complained, but a total failure is not at all encouraging. While travelling through the Rajmahal

hill, Purneah, Dinagepoore, the Turrie and Darjeeling hills, I came across fields of Egyptian, Sea Island and New Orleans cotton: in every case I consider the produce of the first two complete failures while the last (the New Orleans or Upland Gorgian) produced cotton as good as the samples you sent me and I consider was perfectly successful.

The Darjeeling Turrie produced this cotton of a long staple and quite clean and white; in short in no case was it under the mark of the Rajmahal hills cotton I sent you some time ago. I must however mention here that the plants in the Rajmahal hills grow to a large size and the same number of plants covered more ground and looked more bushy in the last named plant than in the Turrie, they also bore more pods—but I am not able to compare the produce (quantity) of cotton in each field.

5th February, 1862.

J. BURKE.

PURNEAH.

The cotton seed received from you and sown in September has not had time to give a yield and therefore the questions in Mr. Doorban's letter cannot be answered. Mr. Blechynden's questions I can answer, as some seed received from him was sown by me in April and the packet received from you in September has also been sown; the result of the April trial has made me give up all thoughts of cultivating cotton in lands such as I have here and I do not think there is any land in Purneah on which cotton can be grown as a crop to give a staple worth anything. The acclimated seed came up very well indeed, nearly every seed, whilst the imported kinds did not vegetate more than 1 in 4 in the Sea Island, or 1 in 7 in the Petty Gulph. The plants grew to some 3½ feet in height and bore from 10 to 15 pods, the cotton was very thin and short and the pods contained nearly all seed. To try and remedy this I cut the tops of the 2nd batch of cotton I had, but the result as far as the size of pod went was the same, and as I attributed this to the poverty of the soil, I did not take any more care of it and gave up the thought of cultivating cotton in Purneah. I may here mention that the subsoil is entirely sand, and this is a feature of the whole district; the surface soil was a mixed light earth such as would yield well with tobacco or rape seed and had

been highly manured. The cotton was white and fine but as far as giving any return to repay the trouble and expense a complete failure. The luxurious growth of the plants gave me great hopes, but as soon as the plant began to pod and the pod to ripen the result became more disheartening. This has been the complaint with Mr. C. Barnes and others and I attribute it entirely to the poor soil, very different to that of Central India where cotton is said to be most luxuriant.

(SIGNED.) R. DeCOURCY.

BERHAMPORE.

In May last I tried the cotton seed supplied me by the Association, distributed a quantity of it about the country and the general complaint was that it did not vegetate. I however managed to rear sufficient plants to plant out 30 beegahs of land in the manner described in the pamphlet furnished with the seeds, but the excessive wet season we experienced this year, followed up with an unusual high inundation, destroyed nearly the whole of the plants and what are now left are stunted and unhealthy, they have borne no pods to speak of; my experiments were on a flat country and the plants suffered from the rain water not being able to drain off.

There is however a very large tract of country in the Rajshye District undulating the high ridges called Kutall generally uncultivated and overgrown with brushwood jungle, rich clay soil, and never subject to inundation; this tract of country I consider may be brought advantageously to operate on cotton cultivation. It has never been tested and it is my wish to bring a few beegahs into cultivation but any expense incurred is thrown away when the seed is bad.

In November 1860 Chunder Mohun Mookerjee a Native Agent of the Cotton Supply Association at Berhampore gave me a few seers of seeds which also turned out bad; but I got a few plants which I reared in my garden. At his recommendation I sowed in November; these plants had numerous pods but they were chiefly blighted. I have lately got three seers of fresh seed from a friend which I have put in at once to test which season's planting thrives best

W. GUNGE:
24th December, 1861.

HENRY DEVERELL.

DEOGHUR (SONTHAL PERGUNNAHS.)

In reply to your letter dated 6th October 1861 I regret to inform you that the sowing of the cotton seed supplied by you have proved a nearly total failure.

The greater part of this seed I sowed myself either in the jail garden or in a patch of land I took for that purpose. But several natives disposed to give the experiment a fair trial also sowed small patches with seed supplied by me, and they met with the same failure that attended my attempt.

The mode of cultivation adopted by me I will proceed to describe.

The greater quantity of my sowings were made in a large patch of land that had for some years been lying waste. The reason for selecting this spot was that elephants had for some considerable time, been kept there, and as I supposed the land was well manured in consequence. The soil itself was very poor, a light gravelly clay over a stratum of rock, but I relied on the quantity of manure and good cultivation for getting a crop out of it. At the first fall of rain I commenced ploughing, and where the land had been prepared as finely as it is the custom here to do for sugar cane, I sowed my cotton. The sowing was broad cast but the seed was carefully and thinly scattered and I contemplated thinning it when it came up, if too thick.

Soon in July the cotton germinated magnificently, the leaf being 8 or 10 times the size of that of the indigenous cotton. From that time to early in September it flourished in the most promising manner, the plants reaching a height of 17 or 18 inches. But then a change took place, the leaves began to shrivel, abortive pods began to shew themselves, and the plants ceased to grow or progress in any way.

I must mention that before these signs manifested themselves I had carefully sown the plants and weeded the land. The heavy fall of rain we had this year could not have seriously affected the plants, as the land in which these were was on a considerable slope which left no standing ground for water.

From the time that the cotton shewed symptoms of withering until this time no improvement has appeared, and I fear the result must be pronounced a failure. The causes of this, in this instance,

might be said to be one or more of the following,—poor soil—improper manure, or late cultivation of the land.

But these causes do not explain why the same want of success should have attended the sowings in the Jail garden where the soil is very tolerable. The land had always been under cultivation for 3 years, and it was manured with the refuse of the garden and cow house. There only remains then the assumption that the system of cultivation adopted, which was the same at the Jail and on the larger patch previously alluded to, was a mistaken one. For no question as to the quality of the seed can in my opinion be entertained for a moment. The failure of the natives who were supplied with seed may certainly be attributed to poor soil and insufficient manure and cultivation. In this part of the country the high lands are very indifferent—the crops they bear, as the rents fixed for them, are nominal as regards the greater quantity. And the cultivator devotes all his attention and resources to his dhan and sugarcane lands that lie in the valleys, saving only his spare time to high lands. With very little cultivation and manure he gets a crop of Indian corn, teel, koostee or indigenous cotton out of his high lands that repays him for his labor; but which only repays him because the rent he pays is next to nothing and the expense of cultivation not much more.

EDWARD BRADDON.

16th December, 1861.

BEERBHON.

In reply to your letter of the 5th Instant, I beg to inform you that I sowed the cotton seed in many acres of land, having previously prepared the soil according to the printed directions.

The seed germinated well and the plants which are three feet apart from each other grew up and were in a thriving and promising state in the beginning. They began to flower and bear pods but afterwards the leaves began to curl and the plants wore a sad and decaying aspect so that the pods began to fall down before they attained to their maturity.

I know not to what is this failure attributed, whether to the enormous quantity of rain we had this year or to the unsuitableness

of the soil. To prevent water from sinking in the roots of the plant I kept the drains clear and adopted ridge system.

After the rains are over from the month of October, the plants are now producing a few pods, but the cotton which is picked up carefully is not of superior quality.

In conclusion I am sorry to say that the plantation did not at all pay for the expense and pains I bestowed upon it.

16th December, 1861.

KOYLAS NAUTH ROY.

KISHNAGHUR.

I am in receipt of your favor of the 6th instant. I am sorry to inform you that the continued rains and unusually high inundation which came into my garden at Bansbaireah and flooded the country in every direction, destroyed every crop in the neighbourhood. I shall however sow this season whenever we have rain from the month of March up to June and observe which is the most favorable time of sowing.

KISHNAGHUR:

JOHN WHITE.

13th December, 1861.

DARASET.

I am sure the Governor General must surely have the effect of introducing neezabad farms more or less cultivated by steam power; I mean the sale of waste lands. Why then rather experiment upon jungle than cleared land?

I should think that ryots would be glad of assistance in the shape of ploughing after a rice or summer crop—to turn up fresh land, and turn weeds under—all this in the month of August, when the land is soft enough for any purpose—perhaps they might be able to sow tobacco and plant it out on this land in October. They would then have no fallows at all on good land.

I have tried deep digging this year to see if it affects the crops. Some tobacco plants came up very fast—but have been spoilt in the rain. The cotton has not been so successful. I sowed first a piece of deep land and several plants came up, but they are at a standstill. Then about 2 beegahs cultivated as tobacco-land—but they came up so sparingly, that I consider it useless to sow more at this time of the year and shall reserve the seed for a few months longer, what remains of it. The 2 beegahs were sown twice, once before

the rainy weather last and once after, so my plants are of both sizes—but neither seem to grow. They are covered with leaves, in some small and in others large, when large, they are in much less number. The season has been most unfortunate. On first receiving the seed, I had long to wait for a sowing “joe,” then before it was sown the cold weather crops were being sown, the beds of tobacco plants—and lastly there has been this drizzly wet weather. But it seems to be the cold which is their greatest enemy, they are not growing as the first few seeds grew, which I put in a garden in August—these were destroyed during a long absence of mine.

I shall take precautions to have land ready to receive the seed which remains next spring—and have it well fenced round to prevent any native mistakes about cattle trespass.

HOBRA FACTORY.

November 22nd, 1861.

SHERLOCK HARE.

BARRASET.

Press of business having prevented my replying to your letter of the 6th December last, I do so now to inform you that on receipt of the seeds referred to therein I had some sown and the plants came up pretty well but soon died in consequence of over moisture; the remainder of the seed I had put in November but not one came up although the seeds had been kept in bottles sealed down.

MORELLGUNGE,

R. MORRELL.

27 March, 1861.

SOONDERBUNDS.

In reply to your letter of the 6th Instant I have the pleasure to state that the cotton plant is thriving very well at present on the “Ellengunge” Estate of which 100 Biggahs have been planted, but in my opinion the issue of seed was rather late for the seed planted in June is now about 5 feet high and bearing (the rest planted as the land was prepared is also doing well) at present.

In continuance I have to inform you that Mr. F. Schiller undertook the risk and expense of the experiment and employed Mr. Bennett who has had experience in the planting of cotton in other countries. I have shewn your letter to Mr. Schiller who will send you from Mr. Bennett a detailed account of the plantation.

CUTTACK.

Dec. 1861,

J. S. DONAHAY.

Dear Sir,—We beg to hand you herewith a sample of, our Soonderbund cotton from the Ellengunge Estate, and we shall feel obliged if you will compare the same with other specimens from that part of the country which may be in your possession. The fibre is very *fine* and from Egyptian seed planted partly in May last, but we think Sea Island or from New-Orleans would give a *strong* produce, and is likely to pay better to the planter if carried out on an extensive scale.

CALCUTTA,

JOHN BORRADAILE AND CO.

1st March. 1862.

SOONDERBUNDS.

In reply to your circular of the 6th instant (to which I would have replied earlier but for pressure of business) I have the pleasure to inform you that the sowings made by me of the seed supplied by the Society have proved seemingly favourable.

I sowed the seed in a Grant (No. 106 in Hodge's Soonderbund map) belonging to Mr. Campbell Macarthur and myself. We purchased the Grant in September 1860, it was then wholly uncleared, and had never been bunded previously. Within a year of our purchase, we bunded about 4,000 Bigghas. On a portion of this bunded land I sowed your seed. It germinated very freely, I send you some of the cotton picked and cleaned, I also send you four of the plants, not picked specimens, but four taken at random. The smaller plants give the greater produce. Most of my cotton unfortunately ripened during the late rains, and in consequence got discolored and spoilt. Some of it ripened and burst in two months from the date of sowing. The plants are still bearing; those that I now send were brought up from the Grant two days ago.

CALCUTTA:

G H. TEMPLE.

12th Decr. 1861.

CUTTACK.

I have to offer many apologies for not replying to your letter before, regarding the success which has attended the sowing of the two kinds of cotton seed which you kindly furnished to the Cuttack Botanical Gardens, but my time has been so fully taken up with professional engagements that I have had little or no spare time to myself.

You may remember I received in all 18 seers of cotton seed, viz. 8 seers Sea Island cotton seeds, and 10 seers Egyptian. The former, Sea Island cotton, failed entirely, the seeds after being a week in the ground became soft, and a little later appeared like powder. I do not think one seed germinated. The Egyptian cotton seed on the other hand, planted at the same time, and under the very same circumstance, germinated freely to the extent of 95 per cent, it is now looking very well. In a future letter I will give you particulars regarding the manner in which I have sown the cotton and prepared the land.

CUTTACK :

R. PRINGLE.

January 20th, 1862.

CHERRA-POONGEE.

In reply to your letter of the 18th ultimo I beg to say that the cotton seeds you sent me did not arrive till long after the sowing season had passed by. I have consequently kept them by me and before the commencement of next rains which is the proper season for sowing I shall have them distributed amongst the cotton growers on the lower ranges of hills towards Assam and will report the result hereafter.

CHERRA POONGEE :

A. ROWLATT.

Shillong 6th January, 1862.

ASSAM.

With reference to your letter of the 18th December I have the honor to inform you that the cotton seed only reached at the beginning of this year and it is impossible I could furnish a report at present as the cotton cultivation season in Upper Assam only commences in the end of February. At present I am distributing the seed and when the sowings have taken place I will communicate the result.

H. S. BIVAR.

LUCKIMPORE ASSAM :

*1st Class Dy. Comr**Dated Camp Pubah 27th Jan. 1862.*

CHITTAGONG.

I must apologize for not having sent a reply to you about the cotton seed forwarded to me by you but I knew that Mr. Ward had reported to you and my report could be only a duplicate of his.

The seed arrived here in a good state and germinated when sown, but it all died off. It was sown at the wrong time of the year.

CHITTAGONG :

14th March, 1862.

C. T. BUCKLAND.

CHITTAGONG.

On receipt of the cotton seed forwarded to me by you in September last, I gave portions of it to all the Gentlemen in this station requesting them to sow it, and report the result. I sowed some in my own garden, and I sent some to the Island of Cootubdeeah, I also sent some to the Zemindars of the hills.

2. That sown in my own garden was on low ground, and never came up, but all that was sown on the hills about the station and in Cootubdeeah germinated and produced plants which to all appearance were very healthy, strange to say however none of the plants produced any pods. Captain Graham obtained three which he sent me, and which I most unfortunately mislaid. The cotton appeared good, but those were the only pods which were reared out of the whole batch of seeds which you sent me. Mr. Sarson Deputy Collector of this District has lately told me that he thinks that the pods are coming on the plants which he sowed, if they do eventually appear, I will send you specimens. The hill Zemindars say that the seeds which I sent them germinated, but I cannot get any very credible account about the result with them, they have sent me neither plants nor pods. I have given one or two Gentlemen a second supply of seeds quite lately, it is possible that the present season is better for the cotton than November.

3. I am rather unwilling to give any opinion as to the reasons of this only partial success, one Gentleman told me confidently that the very heavy rain which we had in the early part of November half drowned the plants, and stunted their growth, but another as confidently declared that had it not been for that rain none of the seed would have come up. We all have about an equal knowledge of the subject, and you will observe that it is not deep. The common country cotton is sown in the month of April, it is more than probable that owing to some peculiarity of climate that month is the proper time for sowing all cotton in Chittagong, and I have kept some seeds for an experiment then. If you have some fresh

seed to spare, I wish you would kindly send me a few pounds by the *Burmah Company's Steamer*. The climate here is very damp and that which I have is slightly affected and may not germinate. I am sorry that I have not a more favorable report to give you, but I trust to be more successful in April next. It is of course even now possible that that which we sowed in November will bear, but I am inclined to think that it will not. It is now about a month since Captain Graham gave me the pods to which I alluded above, and if the plants were good for any thing I think that they would all have borne then.

CHITTAGNG
21st, Feby. 1862.

J. D. WARD,
Offg. Collector.

RAMREE, ARRACAN.

In reply to your letter of the 18th ultimo I regret to inform you that very little of the cotton seed I received germinated, it failed entirely in the Islands of Cheduba and Ramree and only a small quantity germinated at Aeng.

KYOUK PHYOO :
Dated 17th January, 1862.

T. SHEPHERD
Offg : Dy Commr. First Class
Ramree.

MAULMAIN

In reply to your circular of the 18th ultimo I beg to say that the cotton seed sent to me by the Society has been distributed to several persons: whom I will request them to inform me of the result of their sowings, but I fear the seed arrived too late in the season for this climate to give any good results.

MAULMAIN :
13th January, 1862.

S. R. TICKELL.
Deputy Commr. First Class.

In continuation to this Office letter No. 122 of the 13th ultimo, I have the honor to forward herewith for your information copies of communications from Messrs. Buchanan, Smith and Twemlow regarding the sowing of the cotton seeds distributed to them.

MAULMAIN
6th February 1862.

J. K. MACRAE.

Received too late for this season. But a little of the Egyptian was distributed at Kangoon, Paan and Mengsai to three men who

promised to chance a sowing. Have not had time since to go up again and see after it.

6th February 1862.

Sd. G. BUCHANAN.

With reference to your Circular Memo No. 130 dated 5th instant calling for report on the cotton seed distributed for cultivation by the Deputy Commissioner with his letter No. 104 of 20th November last, I beg to state that the seed was received rather too late in the season to admit a fair trial of it—However the following may not prove uninteresting.

On the 25th Nov. 1861—A handfull of New Orleans and the same quantity of Egyptian seed was sown by me, about an inch in the ground, in separate boxes, and watered well—On the 4th 5th and 6th day, the latter, about $\frac{1}{3}$ of the quantity sown came up, but so weak that in a fortnight after, all, but one decayed.—This one, is now about 8 inches high and has 7 leaves on it—The former sort appears to be too old or damaged seed, not one of it came up—On the 15th December I had a handful of each sort tied in a piece of wet linen for 3 days, when open, found that a portion of the Egyptian only germinated—On the 3rd January 1862—The same quantity was again sown in open air, at Toung Woing in a patch of ground lately cleared of jungle for vegetable garden, here I met with better success. There are now about 30 odd plants (of the Egyptian) from 5 to 7 inches high fit for transplanting.

As the season for experiment on a large scale has not arrived (for, I believe, the proper season for sowing Cotton is the commencement of the rains) so no opinion on it could be given till then.

I offered the seed to several Burmese to make a trial but none inclined to accept it

In conclusion, I beg to remark that I fear labor is too high here for paying speculation.

MAULMAIN

(Sd.) D. SMITH.

The 7th February, 1862.

With reference to your request to be informed the result of my cotton sowings in Maulmain, I beg to state that having received

the seeds so late as the 20th November 1861, I did not see any necessity for putting them into the ground *out of season*. I had not the opportunity of seeing the printed paper of instructions promised in your letter of the 20th November until the 6th February from which, I perceive that, it is recommended the land should be prepared in February or March and the seed sown in May, after two or three good falls of rain. I am waiting for this period and shall then proceed to make use of the seeds you kindly sent me. I purpose making my experiments on high land in Mopoon and though not sanguine of doing much I still hope to give a fair trial.

MAULMAIN

8th February, 1862.

Sd. W. TWEMLOW.

ANDAMANS.

I have this day packed two specimens of cotton regarding which I shall feel favored by your obtaining opinions, to be published with a report on the result of our cotton experiments here, which I will send you so soon as our cotton harvest is over.

Whatever way be the report as to the quality of the cotton I send you there can be no doubt as to the profitableness of the article as to quantity, the yield is equal already to 1,200 lbs (if my calculations are correct) per acre but as I have already said I will give you a carefully considered report when the crop is all in.

You will observe that one packet is from the plants grown last year from New Orleans seed which have been allowed to stand and the second packet is from plants of this year from the seed of the crop of last year. This mention is sufficient to indicate the interest attached to them.

January, 1862.

J. C. HAUGHTON.

PENANG

Extract of a Letter from Lt. Coll. O. Cavenagh

By this mail I have despatched an Envelope containing a sample of the produce of the Egyptian cotton seed you kindly furnished me, I have not yet been able to visit the plantation but hope to do so next week. Some of the plants are I hear thriving remarkably well, though a good number were blighted owing to their having been very heavy rain shortly after the seed was put into the ground. The gentleman who owns the plantation expresses himself however

satisfied with the result of the experiment and possibly with greater experience of the nature of the climate any future trial may prove more successful.

PENANG, *Dated 5th February 1862*

Report by a section of the Society's Committee on the samples of cotton referred to in the above communications.

I have the honor to report on the samples of cotton submitted to me as a member of the Cotton Committee of the Society.

1. *Mr. Powell. Rosa, Shajehanpore.*

No. 1, A. The produce of imported New Orleans Seed. As to color and condition the sample is excellent, and in their qualities it is equal to fair middling New Orleans cotton and is only inferior to it in length of staple and strength of fibre, but on the whole it is of a description that would very readily find vent in the English market at probably about two pence per pound less than fair middling New Orleans, and is therefore a very desirable cotton.

No. 2, A. The produce of acclimatized New Orleans seed. Compared with No. 1 A this sample is equally good in color and condition which are both excellent. The staple however is shorter and I think the fibre is harsher although perhaps stronger. It may be valued at about a penny per pound less than No. 1, and is also a very desirable cotton for the English market.

No. 3, A. The produce of plants of New Orleans Cotton of the second year's growth.

The length of staple seems to deteriorate with every remove from the original stock, but notwithstanding this defect it is very satisfactory, in an economical point of view, to know that so useful a cotton can be had from plants of the second year's growth, and the more so as it appears they yield abundantly. This sample shows a very fair soft fibre, softer and finer I think than No. 2, but shorter. I should value No. 2 and 3 at about the same price.

N. 4, A. Native cotton—Is of good color and very clean but of very short staple and extremely harsh though strong in fibre. This description is not worth cultivating for export.

2. *Mr. Burrow's Estate, Jugdispore.*

No. 1, F Cotton in seed raised from N. O. seed. This is a very good specimen indeed. The fibre is particularly soft and silky and the staple is of fair length. The bolls are well filled and of good size. If properly cleaned this would be a very saleable cotton in England.

No. 2, F The produce of Egyptian seed. This is a beautifully fine long stapled cotton, fully retaining the characteristics of its original stock; but it has been injured in color, the bolls having been allowed to burst before picking and the dew or rain have spoiled and injured it; to avoid this the bolls should be taken off as soon as the calyx begins to split, and before it bursts entirely open, then placed under cover where they can expand fully and free of contact with leaves or dew or dust.

3. *Col Cavenagh, Penang.*

G. Cotton from Egyptian seed. The color and condition are very good but the cotton has lost much of the silky texture and length of staple which are the inherent qualities of the original stock. It is however a very desirable description of cotton.

4. *Messrs. John Borradaile & Co.*

D. Produce of Egyptian cotton raised at Ellengunge, Mutlah. This is a fine long stapled cotton but irregular in quality, some of it being rather harsh in fibre and part of it has been damaged by dews or rain before picking, as shown by the stains; the strength of the fibre is thus injured, but on the whole it is a very desirable cotton, and more valuable by two pence per pound than New Orleans cotton: but whether it would be more profitable to the grower than New Orleans it is impossible to say without having the data before us of the relative quantity of ground sown, and produce reaped of both kinds.

5. *Capt. J. C. Houghton, Port Blair, Andumans.*

No. 1. E. Cotton in seed from plants sown in June 1860, gathered Jany. 1862.

There is evidently a mixture in this sample of Sea Island or Egyptian and New Orleans stock. In some of it, the cotton comes entirely off the seed, leaving it quite clean and free of wool which has been till now considered a reliable test of origin: the fine silky

quality of the fibre and length of staple shown in most of the samples would certainly lead me to classify it as of Sea Island stock. At all events I should require some further proof than what is before me of this sample being entirely the produce of New Orleans seed, before I could assent to the allegation that the soil of the Andamans Island can so far alter the appearance of the seed and the quality of the cotton grown there, as to produce, from a downy green-seeded species, (N. O.) a clean black seeded cotton of a much longer and finer staple.

Part of the sample is evidently of N. O. stock but the most of it is I should say of Sea Island stock, and of which too much cannot be produced.

No. 2. E. Is clearly of New Orleans stock and is a desirable cotton—the color good and the fibre of great strength, but the length of the staple and the quality or fineness of the fibre are both inferior to the original stock—nevertheless this cotton would be a very acceptable substitute for the former under present circumstances, but the fact of its inferiority to the original would prove that the soil of the Andamans does not in all cases at least improve the species.

6. *Major, A. P. Orr. Roy Bareilly.*

B. Four Bolls the produce of New Orleans seed furnished by the Society. These show a fair quality of cotton, the color is good and the staple of fair length and strength. The failure of the crop as noticed by Major Orr seems to have been pretty general this season, owing perhaps to excessive rainfall and also to the ravages of insects.

The application of experience cannot entirely ward off loss from such causes; but I feel confident that the want of experience generally as to the time of sowing, choice of soil and treatment of the plant, by Europeans who have hitherto essayed the cultivation of cotton on this side of India, is the chief cause of failure. We may therefore fairly entertain the hope that with perseverance and increased attention to these essentials we shall in time produce cotton in quantity and quality that will stand comparison with the produce of any country in the world.

7. *Mr. G. H. Temple.*

C. Soonderbund cotton raised from Egyptian seed presented by

the A. and H. society. This is a fine long stapled cotton of a very useful description, but the color and the strength of the fibre are both injured by dews or rain—part of it is also very imperfectly cleaned, being full of the straw or husks of paddy.

CALCUTTA :

STEWART DOUGLAS.

29th March, 1862.

I beg to hand you the following Report on the various samples of cotton you sent to me for examination some days ago.

Received from Mr. Powell of Rosa Shajehanpoor. Very clean,

No. 1 A from imported New Orleans seed of 1861 sown in May. good color and condition, well grown, and evidently gathered at a proper time and it is separated from the seed with care; the

fibre is soft, fairly strong, and in length equal to the standard of American grown (New Orleans) as given by the Cotton Supply Association. I consider its value and usefulness to be nearly equal to fair

No. 2 A from acclimated New Orleans seed. middling *Orleans*.

Also from Mr. Powell. This is quite as clean and good in color as A, 1. the fibre is somewhat harsher, more irregular in length, shorter but stronger than 1-A; still it is a very useful cotton and little inferior in value to the above.

No. 3 A from plants of 2nd. year's growth New Orleans kind. It is excellent in color and condition, soft fair length of staple. I fail to discern that it is in any way inferior to sample 1 A and give it equal value and usefulness; it is a very desirable kind of cotton.

No. 4 A. Native cotton. Also from Mr. Powell. The color and condition is as good as it well could be, but the staple is so very short as to make it almost valueless for manufacturing by modern machinery.

I consider these experiments of Mr. Powell very interesting—he appears to have given much attention to the subject. I would suggest that he be requested to furnish the Society with a few more particulars of the result, as regards the quantity produced, and the cost of cultivation per acre up to the close of the season of production; and if he would state generally, the quantity of rain which may have fallen, or the number of times the plants have been irriga-

ted during their growth, it would be useful information: the soil and climate of Shajehanpore are seemingly suited to produce good cotton, but it remains to be seen how far its cultivation will be remunerative—I quite concur in Mr. Powell's remarks that the more the soil is tilled the better, if it is done deep enough; in moderately sloping ground, the plough or trenching furrows should run across, and not up and down the slope, and during the rains the surface of the ground to be left as *rough* as possible, in which case there will be very little washing away of the soil, unless the subsoil is a very retentive one.

B from New Orleans seed. Grown by Major A. P. Orr, Roy Bareilly Oude. The four bolls under notice are generally good in every respect; it is very discouraging that the experiment was such a general failure, in all the villages where its growth had been tried.

C from Egyptian seed raised in the Sunderbunds. From Mr. G- H. Temple. This is a fairly grown cotton, but has been improperly treated on reaching maturity, it is evident the pods have been allowed to open fully and remain so for some time, before the cotton has been removed, and thus it has been subject to the deteriorating influence of dews and rain spoiling the color, and some of it appears to have been picked up from the ground, as it is dirty and mixed with straw &c.

The staple is soft and strong, and had more care been taken in picking the bolls it would have been a valuable cotton.

D from Egyptian seed raised in the Sunderbund grant at Ellengung. Received from Messrs John Borradaile & Co. This sample is also discolored from the bolls being allowed to remain long open before the cotton was removed, dews and rain have stained it. It is rather more harsh than the general run of Egyptian, irregular in length of staple, but on the whole a fair length; it is a desirable kind of cotton, the weight produced per acre would probably be much less than from New Orleans seed. I believe Sea Island descriptions would be best adapted to the soil and climate of the Sunderbunds, and it is not unlikely the produce would be a quality between Sea Island, Egyptian, and by degrees produce the latter kind only as in the Delta of the Nile.

E No. 1 from New Orleans stock sown in June 60. and this sample being from 2nd crop gathered in January 62.

Received from Captain J.C. Haughton, Port Blair, Andamans. I have much doubt if the greater part of this sample in seed is not from Sea Island, or Egyptian stock; it is well grown, good color, and condition, and the staple is of fair length, and strength: if grown in quantity like the sample, it will always fetch a higher rate than N. Orleans; a small portion of the sample appears to be from Orleans seed; and probably a portion of the E 2 has got mixed with it.

Raised at Port Blair by Capt. J. C. Haughton. It is a true

E. No. 2 from plants of New Orleans stock acclimatized seed sown in June 1861 gathered Jan. 1862.

N. Orleans kind—good color and condition, strong fibre but rather shorter than it should be, it is a description that would find a ready sale for almost any quantity.

Received from Mr. Burrows. This cotton is still in the bolls,

No. 1. F. Kupas raised from New Orleans seed in the Jugdisporo Estate.

which are uncommonly well filled, very good color and condition, soft and silky,

more so than generally found in these kinds of cotton, fair length and strong staple, it is a most useful valuable cotton and which appears to have taken well to the soil of that district.

This is well grown, the seed is ripe, and if I had not known its

No. 2, F. Kupas from Egyptian seed grown as above.

origin, I should have classed *its seed* as the finest Sea Island I had seen, being very large, dense black, and free from fibre for

more than $\frac{2}{3}$ ths of its whole surface; the cotton is somewhat stained, but it is in every other respect a fair specimen of the Egyptian kind.

Received from Col. Cavenagh. The color and condition is very

G. from Egyptian seed raised in Penang.

good, is more harsh in texture and shorter in staple, than the usual run of Egyptian,

and it is a description of cotton which would meet with an extensive demand.

CALCUTTA

W. HAWORTH.

5th. April, 1862

I beg to hand you the following Report on the samples of cotton received from you this day for examination.

Report on thirteen samples of cotton received from Dr. Bonavia Secretary Agricultural and Horticultural Society of Oudh.

I consider Dr. Bonavia's report on his experiments in cotton-growing in Oudh is a generally interesting one, although the result of his labours may have disappointed him. It appears these experiments have suffered as much from an excessive fall of rain over the past season as has been so much complained of from other districts, causing much destruction from insects; yet the soil in which these experiments have been made, must have been very light and porous to enable so much water to percolate through it. I quite concur with the Dr's recommendation of deep tillage for all kinds of cotton, as also that a moderate quantity of manure is serviceable on most soils if thoroughly intermixed with the soil a few months before the seed is sown, but if applied in equal parts of rotted manure and earth as suggested by him, I think the cotton plants would be likely to run too much to wood, in which case it is probable there would be a small crop of cotton.

It is satisfactory to find that the Dr. has been in a small degree successful in his attempts at Hybridization, it would have been more so, had his success been in connexion with Native stock, further experiments may yet realize some good in this direction.

Sample No 1 from New Orleans seed— This sample is still in the bolls which are well filled, the cotton is good in color, and

it has been taken from the plants at a proper time, the staple is rather shorter and a little harsher, than the ordinary run of fair

„ No 2 from same middling Orleans. This is also in the bolls, seed but not near so well matured as the 1st

sample, the staple is however softer and more silky, it is also a strong fibre.

„ No 3 from ditto— This sample is in seed, and to a small extent it is mixed with the produce of Egyptian seed. It is also stained from the open pods being left too long on the plants, and the staple is irregular in length and strength.

„ No 4 from ditto This sample has been cleaned, it is somewhat stained in color, the staple is *short*, and soft, but of fair strength, may be classed with low middling Orleans.

„ No 5—seed from the above ; This is seed only, the cotton has been well removed—it has not a healthy appearance about it, and I should doubt if much of it would vegetate.

Egyptian No 1— In bolls, it is healthy looking but somewhat stained, the staple is not equal in length or softness to fair Egyptian—the seed looks fairly matured—

ditto No 2 Also in bolls, but more stained and worse grown, and in every respect inferior to the last sample.

ditto No 3 Appears to be the cotton in seed removed from such bolls as forms No 1 sample (Egyptian).

ditto No 4 Appears to be the same cotton but cleaned from the seed ; it is discolored, shorter and harsher in fibre than the general run of Egyptian, and more resembles New Orleans cotton.

ditto No 5 . Is the seed only from those samples, not one half of which is matured.

No 1 Native Cotton in seed. This is ordinary fair color, harsh, *very short staple*, and not of much value for manufacturing purposes.

No 2 ditto. This is the same cotton as No. 1 Native with the seed removed, it is more stained than No 1—

No. 3 Seed As this is merely the seed alone from the above kind, it needs no comment.

Sample of cotton from Nawabgunge This appears to have been produced from Egyptian seed and it may be looked upon as a failure.

Received from the Deputy Commissioner of Gonda. This is a very poor specimen of the produce of Sea Cotton from Sea Island seed. Island seed, it is very dirty—stained—exceedingly weak in fibre, a silky soft texture but very nabby making it difficult to spin.—There are *no signs* of any care or attention having been given to its cultivation.

CALCUTTA :

W. HAWORTH.

5th April, 1862.

*Thirteen Samples from Dr. Bonavia, Lucknow,**5 of these being the produce of Imported New Orleans Seed.*

No. 1. Good bolls—This is by far the best produce that I have seen of this stock grown in India. The bolls are unusually large, some of them with 5 valves and all well filled and have been carefully plucked at the proper time. The Cotton is nearly equal to fair middling New Orleans and worth, 1st. March 1862 in England (cleaned) fully 12 to 13 pence per pound.

2. Imperfect bolls that have been prevented coming to maturity and much of the seed spoiled by the attack of maggots, the fibre and color is much deteriorated from the same cause, otherwise the texture of the cotton is softer than No. 1.

3. Cotton in the seed; a very desirable quality, but partially injured before maturity by the maggot; worth when separated from the seed 11 to 12 pence per pound in England.

4. Cleaned Cotton—This is a very desirable cotton, well cleaned, of excellent color, and fine soft texture; its only defect is shortness of staple, but I value it at fully 10 pence per pound in England.

5. The seed only—This seed has all the characteristics of its origin being the green seeded species, now known as "New Orleans;" the separation of seed and cotton has been well effected; there appear to be very few crushed seed, but I find nearly one half of the quantity quite destroyed by the maggot probably before maturity.

Four Samples the produce of Imported Egyptian seed.

No 1. Good Bolls—This Cotton maintains its original character for softness of texture, and is of fair length of staple. The fibre I find particularly strong and it is a most desirable description of cotton to cultivate and worth in England fully 12½ per lb. cleaned. The bolls appear to have suffered partially from dew or rain, affecting the color and condition of the cotton more than the seed, which is mostly sound.

2. Imperfect bolls much injured by the maggot, and also I apprehend by dew or rain at the time of plucking. The Cotton is of little value and the seed almost entirely perished.

3. Cotton with seed :—This sample represents a quality similar to, but scarcely as good as No. 1 the fibre has not the same strength and the general condition of the cotton is less desirable.

4. Cleaned cotton of the same description as No. 3 :—this sample is decidedly inferior to No. 3 both in length and quality of staple and strength of fibre, it is well cleaned, but partially stained, which detracts from its value, which I estimate at about 10 pence per lb.

5. The seed only of the Egyptian description :—Fully half of it is worthless, probably from the attack of insects while in the pod preventing it ever coming to maturity.

Three Samples of Native Produce from Dr. Bonavia, Oude.

No 1. Cotton with seed—Is a fair sample of ordinary native, cotton; it is harsh, but clean, and of good color and strength but has the usual great defect of all indigenous cotton, *Viz.*—want of sufficient length in the staple to make it a desirable cotton for spinning into yarn of any number above 20.

2. This sample of cotton without seed appears to me of rather better quality than No. 1 and is very well cleaned and in condition very superior to most samples of Native Cotton. I value it at $7\frac{1}{2}$ pence per lb in England.

3. The seed of the above samples by itself; is in fair condition well separated and mostly sound.

Sample of Cotton from the Deputy Com. Durreabad grown at Nawabgunge.

This is doubtless the produce of Egyptian seed but is nearly worthless; the pods have probably been attacked by the worm before maturity, but the very poor produce also indicates that the soil or culture or perhaps both were unsuited to the success of the plant under any mere atmospheric influence.

Samples of Cotton from the Deputy Comr. of Gondah.

This sample is the produce of Sea Island seed, and retains its characteristics of softness and length of staple, but it is very weak in fibre and very knotty, the color and condition are both very objectionable and it is impossible to put a value on it. The few pods sent with this sample, the produce of acclimatized Sea Island seed, are in better condition as to color, but are very poor specimens of this species, and the cotton has deteriorated from the original stock both in length and strength of staple.

16th April 1862.

(Sd.) STEWART DOUGLAS.

Progress of the cultivation of Cinchonas on the Neilgherries.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following letter from Mr. W. G. McIVOR, to His Excellency the Honorable Sir WILLIAM DENISON, dated Ootacamund, 5th April 1862 :—

1. I have the pleasure to enclose you a drawing of our new method of propagation, also a Report of what we have observed to be the requirements of the plants so far as we have proceeded with our operations, and everything seems to argue that open cultivation will be the most successful and profitable, but your Excellency will be able to judge from the statement of facts given in the Report itself. I am happy to be able to give a good account of the parcel of seeds I received on the 4th of last month; the first sowing was made the same day, and yesterday this sowing had yielded 4,193 transplanted seedlings of the Cinchona Condaminea, and a small parcel of about 125 seeds (all that we had received) of Cinchona Crespilla sown on the same day, had yesterday yielded 82 transplanted seedlings of this sort, this is a success with imported Cinchona seeds, which has never been equalled in any country, and still many more seedlings are daily coming up. Our new propagating house is invaluable, both for rearing seeds and for propagation, and if we had another similar building at Neddivattam it would be of great use.

2. We have now over 25,000 plants in all, including the seedlings, and this number will be nearly doubled by the end of this month so that we will have much over the number of plants we expected to have at the end of July. In my estimates for next year, I have only estimated for 150 acres of new land to be brought into cultivation; I now see we can have plants to do over 500 acres if your Excellency think it desirable, but I thought when sending in the estimates in December that we might not have plants to do more than the 150 acres; and perhaps we may be content with this quantity, until we see our way a little more clearly, with regard to a given system of cultivation best applicable to our soil and climate, as a year's more experience would be

very desirable before we came to any definite conclusion on this subject, and perhaps the loss of time may be more than made up by what we will gain by experience. I will inform your Excellency as soon as Mr. Lyall arrives, of the condition of his plants; and as I expect to receive the opinions of some of the great authorities on our proposed method of cultivation, I will forward them at the same time.

Remarks on the cultivation of Cinchonas on the Neilgherries.

1. *Rearing seeds.*—The first sowing of imported seeds took place in the beginning of February 1861. No certain data being given for the treatment of Cinchona seeds, our first operations were necessarily experimental, and a good number of seeds were lost by being sown in too retentive soil and supplied with what, to Cinchona seeds, proved to be an excess of moisture. The greatest success we obtained in our first attempts was with the use of a soil composed nearly entirely of burned earth, and of this sowing nearly sixty per cent. germinated. The temperature of the earth being about 70°, the period required before germination took place in the several sowings varied from 62 to 68 days. The seedlings made but little progress for the first six weeks, but after that time they sprung into rapid growth, averaging from 1½ inches to 2 inches per mensem.

2. A supply of seeds of the valuable Cinchona Condaminea, received on the 16th February 1862, were sown on the same day in a very light open soil composed of a beautiful open sort of sand, with a very small admixture of leaf mould. Our experience with the first seeds having established beyond all doubt that the Cinchonas are very impatient of any excess of moisture, particular care was taken in the preparation of the soil used in this sowing. The earth was in the first instance exposed to the sun for two or three days and thoroughly dried, it was then heated to about 212° in order to destroy all grubs or larva of insects; after being allowed to cool it was brought into the potting shed and watered sufficiently to make it moist, but only to that degree of moisture that the particles of soil would not adhere together on being pressed

firmly with the hand, that is, the earth on being laid down was sufficiently dry to break and fall into its usual form. With the soil in this state the pots were filled, the surface lightly pressed down and the seeds sown thereon being lightly covered with a sprinkling of sand. The pots were then placed on a slight bottom heat of about 72°. These were never watered in the strict sense of the word, when the surface got dry they were slightly sprinkled with a fine syringe just sufficient to damp the surface, but never to penetrate the soil. Under this treatment the seeds began to germinate very strong on the 15th day after sowing, and at this date, 17th March 1862, or twenty-nine days after sowing, upwards of 60 per cent. of the whole of the perfect seeds sown have germinated, and we may fairly hope to rear over 90 per cent. of this sowing. I may, however, observe that these seeds possessed the great advantage of being forwarded to India in a letter, and thus they were not subjected to the damaging effects produced on seeds sent out in air-tight parcels, the reason of this is the want of a circulation of air through the packets and the consequent deposit of moisture on the interior of the outer covering by every increase and decrease of temperature on the voyage. As soon as the seeds germinate they are carefully pricked out into fresh pots (the soil being prepared as before described for the seeds). This must of course be done with very great care. The radicle being carefully covered with soil while the seed and cotyledons are kept above the surface. In this way about 25 seedlings are transplanted into a four inch pot and treated in every respect the same as the seeds, that is, they are never watered, the soil being merely sprinkled, as before stated, to keep it in that medium state of moisture in which it was first put into the pots. This prevents the damping off of the seedlings, to which they are very liable when treated otherwise; it also greatly facilitates their growth and the formation of roots, the soil being so perfectly open that it is readily affected by the atmosphere and thus kept in the most favorable condition for promoting vegetation. When treated in this way our seedlings have made an average growth in ten months of over 18 inches, the growth being much more rapid towards the end of the ten months than in the earlier stages.

3. *Propagation*.—As soon as the seedlings and imported plants attained sufficient size, they were propagated by being layered, in this way it was found that they rooted readily in about six weeks or two months, and by being bent down caused them to break or throw out shoots from every bud; and not only this, but many latent buds were developed, and a fine growth of young wood produced for succeeding layers and cuttings. The principle of layering being so well known to English gardeners requires no detail, but in this species of plant it was found they were very liable to *bleed*, and this not only weakened the plants, but retarded the formation of roots, this we found to be remedied in a great degree by inserting in the cut a triangular piece of perfectly dry broken porous brick. An abundance of young wood being produced we proceeded to propagate by cuttings, the earth being prepared with great care, the same as for the seeds with the exception of not being heated, the ends of the cuttings are placed upon pieces of perfectly dry porous bricks, around the sides of the pots. They are then placed on a bottom heat of 75 or 80°, and treated in this way young and tender wood roots in about three weeks or one month. Older wood in from six weeks to two months. With cuttings of the young wood our loss has not exceeded two per cent., and with older wood about 10 per cent.

4. Our object being to produce the largest number of plants in the shortest possible space of time, it was found that cuttings and layers required more wood than could be conveniently spared, and it was resolved to try the propagation by buds; in this respect the success has been most satisfactory. The accompanying drawing illustrates the manner in which this is accomplished, the secret of success entirely lies in the amount of moisture given, if in excess they rot immediately, but if sufficient care is exercised in reference to moisture, the losses will not exceed 3 or 4 per cent. The pot on the left shows six *C. Calisaya* buds put in on the 30th January, which had all rooted in forty-one days after; being the date on which the drawing was made by Mr. Batcock. This drawing represents the natural size of the pot and growth of the buds at the date given. It may be observed that it is not necessary that ~~anything~~ should be attached to the bud, this is no doubt an advan-

tage, although we have struck many buds of the Red bark without leaves and also a few of the Calisayas.

5. It ought to be explained that the reason why the earth is brought to a medium state of moisture before being put into the pots, is because it is never afterwards watered to such an extent as to render it really wet, being in fact just kept in that state of moisture in which it was originally placed in the pots, and this uniform and medium state of moisture is rendered more easily kept by the pots being plunged in beds of earth. The reason why we found this system necessary was that when the soil was watered in the usual way after the seedings or cuttings were placed in it, it was found from its expansion and adhesion by the action of the water that the particles of soil were forced far too close together to be beneficial to the growth of the plants, and in many instances it proved to be injurious, vastly retarding their growth.

6. In the Nurseries, in the open air, the same principle of cultivation and propagation as that described above has been adopted, and with reference to the condition of the plants and layers with nearly equal success. The period of rooting of the layers being from two months to ten weeks, while cuttings take from two to three months, the average loss being about 15 per cent.; this occurs from the impossibility in the open air of keeping a uniform state of the atmosphere around the cuttings. With layers this is not so important as they root quite as certain (though slower) as in the propagating houses, and flourish equally well.

7. *Formation of Plantations.*—The mode of cultivation of these plants likely to prove the most advantageous being uncertain, it was resolved in May and June of 1861 to place out a number of plants under different conditions of shade, exposure, &c., and the result has been that the plants placed without the protection of living shade have made the most satisfactory progress, and borne the dry season without the least injury. The plants placed under living shade were found to be damaged in some degree during the rains by the incessant drip, but on the weather clearing up threw out new leaves and quickly recovered. Nine months after planting or at the end of our dry season these plants were found to be suffering considerably from the drought, on taking a few of these plants up,

it was found that the holes in which the Cinchonas were planted had become entirely filled by the fibres of the roots of the living trees in their neighbourhood, which had drawn up the whole of the moisture and nourishment from the soil in which the Cinchona plants were placed. In putting the plants out which were placed in the open air, we of course saw from the first, that with the young plants we had to combat the bad effects of excessive evaporation during our dry season under a bright and scorching sun; we also saw the injury likely to be done to the plants by radiation during bright and cloudless nights. To obviate these disadvantages the plants were sheltered on the approach of the dry season by a rough enclosure of bamboo branches, with the leaves adhering to them (as illustrated in the drawing), so as to give them sufficient shelter both from the effects of evaporation and radiation. In addition to this shade of the branches of cut bamboos, the soil around the roots of the young Cinchona plants was covered with 1 or 2 inches in thickness of half decayed leaves, and the plants thus treated show a very great luxuriance which is not exceeded by any of the plants in our propagating houses. To ascertain the cause of this luxuriance a few of the plants were recently examined, and although at the end of the dry season, the soil about the roots was found to be perfectly moist, thousands of young rootlets of great strength were found to have been thrown into the covering of decayed leaves, so that it had become one matted mass of beautiful white roots many of them nearly the thickness of a crow quill.

8. From these observations we have resolved to place out this season 75 acres of Cinchona plants in cleared land, and exactly under the conditions and treatment last described. We also propose planting 75 acres under various degrees of living shade in which every attempt will be made to mitigate as much as possible the injurious effects of this system already described. The cultivation of these plants being experimental, it is necessary that we should give every method of cultivation which appears reasonable a fair trial; and that only developed facts should influence us in giving preference to one method of cultivation over another. The distances at which we have prepared to place the plants are for the larger species from 9 to 10 feet apart, for the sorts of medium

size 8 feet, and for the shrubby sorts 7 feet, these distances are of course too close to admit of the plants attaining a full size, but we believe that it will be advantageous to plant them close in the first instance, and thin them out afterwards. In order to illustrate the extreme growth of our plants, it is worthy of note that one or two of them although not yet twelve months old have attained a height of about 5 feet by $3\frac{1}{2}$ in diameter through the branches, we may therefore conclude that the plants will in about two years fairly cover the ground if placed at the distances given above. When they begin to crowd and impede the growth of each other they will of course be thinned out and pruned, and it is anticipated that a good supply of bark may be obtained by these means in from eight to twelve years, or perhaps earlier.

(Signed) W. G. McIVOR.

Government Gardens, Ootacamund,

22nd March 1862.

Selections.

COTTON CULTIVATION IN INDIA.

A rather animated controversy is now being carried on in the *Times*—on the subject of Cotton culture, and the expected extension of the Cotton trade in India—between the Committee of the “Cotton Supply Association of Manchester” on the one side, and Mr. James Petrie, late engineer of the Coimbatore Cotton Farms on the other. The matter in dispute being essentially agricultural in its nature though mixed with a considerable dash of the commercial element, I should like to see it discussed in your columns, and, with your permission, will endeavour to place before your readers a general view of the subject, by whom I feel sure the debatable points will be skilfully investigated and have new light thrown upon them. The object of this appeal to your contributors is to request their assistance towards the solution of two questions which, it seems to me, gardeners and farmers only are competent properly to investigate and decide. These are, can the staple of Cotton be permanently altered and improved by superior cultivation of the plant; and can the productiveness of the plant be materially increased by high farming? Of course, reasoning from analogy and with the figure of that latest agricultural prodigy, Pedigree Wheat, lying before me, it seems impossible to doubt the possibility of greatly changing for the better both the productiveness of the plant and the quality of the staple by judicious culture; but still, as I will by and by show, the task is not a very easy one, nor one to be entered upon now for the first time. Reports on reports of Parliamentary Committees have for the last 40 or 50 years been published on the subject of improving, both in quantity and quality, Indian Cotton, and attempts to attain this much-desired object, almost without number, have been made in almost every part of India, but hitherto with only partial success. About 20 years ago the Court of Directors of the East India Company, at the suggestion, I believe, of the Manchester Cotton interest, entered systematically on the task on a great scale. Their first step was to engage the services of 10 experienced Mississippi Cotton planters (the best Cotton being brought from that State), and send them to India for the

purpose of introducing the American Cotton plant and with it the most perfect form of American Cotton farming, it being at that time supposed that the inferiority of the Indian staple was mainly attributable to the imperfect culture. Their instructions were primarily to introduce the American Cotton plant, and with it American Cotton farming into India (of course expecting that under American culture it would be as productive as in Mississippi), and next, to try to improve the indigenous one by their superior husbandry, in the expectation that its staple might be thereby improved and lengthened, so as to admit of its being used as a substitute for "New Orleans" by English spinners. With these objects in view the planters arrived, well provided with American agricultural implements and a good supply of excellent fresh seed. Still further to ensure success and prevent jarring between them and existing authorities, superintendents were appointed in each of the Presidencies to correspond for them direct with Government, but having no control over their agricultural operations. It fell to my lot to be appointed Superintendent of the Madras branch of the experiment, with which I continued connected from 1840 until 1853, when I left India. The first half of our instructions, that of introducing the American plant, was easily effected, 13 years of invariable success having proved to us that it could be perfectly naturalised in India: moreover, that it could be as easily, and much more profitably cultivated than the indigenous one: that whatever soils suited the one were adapted to the other; that the staple fetched in England prices very nearly, if not fully, as high as that grown in America; and lastly, that after 13 years' cultivation neither the plant nor staple had deteriorated, though the seed had not been changed. The staple, indeed, had been pronounced by dealers superior to that raised from fresh seed imported on purpose to test that point. Such was the answer returned to the main question on one essential point, derived from native, not American or European information, that point being the profitableness of its culture as compared with native cotton. About four or five years before I left—the exact year I cannot now recall, having no notes or memoranda to refer to, but I think it was 1848 or 1849, a most unfavourable season occurred, no rain fell for many weeks after sowing, and the native Cotton crops all round Coimbatore almost completely failed; the plants either died altogether, or were injured beyond recovery when copious rains did afterwards fall. With the exotic the case was far otherwise; the plants continued to live, and at once, on the advent of rain, began to push vigorously and finally matured a crop. Several natives whom I had induced to cul-

tivate that year, assured me that they had actually received more from their land that bad year, than they would have done from an average crop of native Cotton in a medium one. From this time the "new Cotton" became a very decided favourite, the quantity offered for sale doubling every year after till I left, and the year I did leave I distributed about 20,000 lbs. of seed among intended growers. Such in brief is the result of 13 years' cultivation of American Cotton by Americans, Europeans and natives in India, under my own supervision, leaving not the least doubt on my mind, whatever others may think, that the American Cotton plant can be readily naturalized and profitably cultivated in India — While thus engaged in working out the answer to the then supposed major proposition, the minor, that of improving the productiveness and staple of the native plant, was not for a moment overlooked. On the contrary, even more, if possible, care was bestowed on its cultivation than on the other, but to little purpose. It is true we often succeeded in raising larger plants and finer crops than our neighbours, and seed taken from these were, through a succession of 10 or 12 years, grown on all kinds of soils, but during all that time the pods neither increased in size nor the staple in length. The relative proportion of wool to seed also remained nearly the same; that is fluctuating between 20 and 22 per cent. but averaging 21. In the American we found it between 28 and 30, about 29½, as well as I can recollect, being the average. But though all our attempts in this direction unhappily failed, I cannot believe the difficulty insurmountable and think the design ought not to be relinquished. English farmers have for generations been trying to improve their Wheat, with but indifferent success until Mr. Hallett took it in hand, and, going the right way to work, has, in the course of about 10 years, succeeded in producing his "Pedigree Wheat," a variety which if it only proves permanent promises in a few years to supplant all others in cultivation. Such is a very brief summary of our 13 years' labours in Coimbatore. In Darwar, a district somewhat more favourably situated, the success, in the case of the exotic, was even greater, and, fortunately for them still continues, as I hear that upwards of 60,000 bales are expected this year from that quarter. Had the same encouragements been extended to Coimbatore, at least as much more might have been obtained from it by this time; there being upwards of 2 million acres of ground suitable for its cultivation in that district, and the ryots were most favourably disposed to embark in the business. With these facts before me, full details of which are to be found in the several Cotton and Indian Territories Blue Books published between

1847 and 1853, I read with much surprise and regret, considering the source whence it came, the following paragraph, which I quote from a letter from the "Committee of the Cotton Supply Association," authenticated by the signature of the Secretary and published in the *Times* of the 8th Inst. "Before resigning all hope it may be well to have some further evidence than is afforded by the results of these experiments. It is pretty well known that the Government farms did not succeed because they were not intended to succeed. The Court of Directors did not want 'interlopers' in India, and the facts of the case show that either they had predetermined that these experiments, thrust upon them by the representatives of the Cotton interest in and out of Parliament, should be failures, or that they (the Government) were grossly imposed upon by the American planters in their employ." On this most extraordinary passage I can only trust myself to venture one remark, namely that if the Cotton interest had done their duty but half as well as the Court of Directors did theirs, they might now have been receiving from India little short of half a million bales of American Cotton, and with all the means and appliances in perfect working order to double the quantity at short notice. Next week I shall briefly compare American and Indian Cotton agriculture, preparatory to entering on the consideration of the questions—can the staple of the several varieties be altered by cultivation, and can productiveness be increased by high farming? *Robert Wight, Grazeley Lodge*
October 21, 1861.

I last week showed that the East Indian experimental Cotton farmers had perfectly succeeded in naturalizing the American Cotton plant in India; and that the Ryots had ascertained that American Cotton was a less precarious and more profitable article of culture than their indigenous staple. I propose now to consider the relative merits of American and Indian Cotton Agriculture. In a letter from the Committee of the "Cotton Supply Association of Manchester," addressed through their Calcutta Agents to the Governor General of India, the following passage occurs: "By thus introducing Europeans into the country, with greater intelligence, energy, and enterprise, than that of the natives, superior methods of agriculture will be adopted, and great care will be taken in the preparation of the produce for the market." To this His Excellency directs his Secretary to reply:—"The Governor General in Council desires to remind the Association that the general testimony of well qualified observers, American as well as English, goes to prove that in the details of cultivation the natives of India have little or nothing to learn from the agriculturists of other quarters

of the globe, and that it is only in the gathering, cleaning, and transport of Cotton, and not in its cultivation, that much improvement can be expected." I would observe here that in picking and cleaning they are not excelled by Americans: better picked Cotton could not be than thousands of pounds of seed Cotton I bought on Government account direct from the Ryots, and the Churka is superior to the saw giu in everything, except speed, for separating the Cotton from the seed. The Association are not quite pleased with this reply, which they say "they have read with considerable surprise. They thought it was universally admitted that the agriculture of Hindostan was essentially rude and primitive; that the implements by which it is conducted are most inefficient; that as to the use of machinery, the proper rotation of crops, the application of manures, the choice of seed, and, in fact, the entire round of culture, the natives are deficient, if not in knowledge at least in practice. This view the committee formed on the testimony of travellers of repute and of innumerable witnesses now or formerly resident in India who have spoken or written upon the subject" In support of the above thoughts "they would also respectfully submit that as in America 600 lbs. of clean Cotton per acre is considered an average crop, while in India the average crop does not amount to 100 lbs. per acre, they believe there is full scope for improved culture, and a better development of the industry of the country; and that satisfactory evidence of the result of cultivation is seen in the few thousand bales of a highly improved and excellent class of staple, already received thence." Mr. Petrie, adverting to these passages, replies to the effect that, when the natives were furnished with New Orleans seed, they cultivated it after their own fashion with these rude and primitive implements, and succeeded in turning out nearly as large crops of quite as good Cotton as the American planters could do, with all their costly implements and agricultural skill and at less than half the cost. He thence, coinciding with the planters themselves, concludes that if ever India is to become a great Cotton exporting country, the natives must be the cultivators, Europeans providing the inducement by simply opening depots or markets with fair prices, in the several Cotton growing districts; establishing in them trained buyers ready to purchase all good Cotton offered for sale, and preparing it for transmission to the distant market, wherever that may be. Europeans he considers can never become Cotton planters in India; the profits there accruing from Cotton culture being insufficient adequately to remunerate him, while those of an agent or buyer, if carried out on a considerable scale, are ample. In these opinions he does not stand alone. The Associa-

tion, however, not approving of them, somewhat grandiloquently answers, "It is an established axiom all the world over, that there must be good farming if you are to have a continuance of good crops, and Cotton offers no exception to the rule. Does Mr. Petrie entertain any doubt as to the miserably backward state of Indian agriculture? Can he fail to perceive the cogency of the following queries by the Editor of the *Bengal Hurkaru*? Does his lordship (the Governor General) mean to say that the ground scratched with a crooked stick drawn by Bengalee bullocks, and ignorant of manure and drainage, is unsusceptible of improvement by the application of European mechanical skill and European science?" The Governor General, as I understand the passage, does not say that Indian Cotton agriculture is unsusceptible of improvement, but simply states a present fact, resting upon American and European testimony, which I apprehend these who can reason back from results to the means by which they are accomplished will endorse; without at the same time denying that, like our own, Hindoo agriculture is still susceptible of great improvement. The above extracts seem to embody two distinct propositions, namely—1st. That owing to his "rude and primitive" implements and farming, the Hindoo can only obtain 100 lbs. of clean Cotton per acre, while owing to his more advanced and scientific farming and appliances the American planter is able to realise, as an average crop, 600 lbs. from the same area. 2d. That until Europeans take the business in hand and bring their superior energy, intelligence, mechanical skill, and science to bear on the Cotton culture of India, India never can replace America in supplying Europe with Cotton. If these propositions as they now stand correctly embody the views of the writers, then I feel constrained, as regards the first, at once to dispute the soundness of both the premises and conclusions. The average crop of clean Cotton on the best land of the Mississippi State, as I was often told by the planters, does not average 400 lbs. per acre; though that quantity was often obtained, the general average was supposed to range between 300 and 350 pounds, in other words that average land well cultivated returned about 1000 lbs. of seed Cotton per acre, equal to about 330 lbs. of clean. The correctness of these statements is confirmed by Dr. Mallet, who in his elaborate paper (read before the Royal Society, June 4, 1861), on the "Chemical and Physical Conditions of the Culture of Cotton," says that in Alabama on their best Prairie lands, "a bale of 400 or 500 lbs. to the acre is sometimes obtained under favourable circumstances, but this is much above the average for upland Cotton." The same author further re-

marks:—"Although much virgin soil remains in the Southern States untouched by the Cotton planter, it needs but a slight knowledge of the country to discover the vast extent of 'worn out' Cotton fields already existing even in the most recently settled States, not to predict a time when the growing demands for the staple must compel," &c This confirms a further statement of our planters, that in Georgia 60 lbs. of seed Cotton was considered a good crop, which is about what we obtained off our medium lands in India, but much below what the best produced. The premises, namely that the American planter is indebted to his superior husbandry and appliances for his larger crops, being found wanting, the conclusion that the transfer of his scientific farming and better implements to India would raise the Indian crop to the American standard, must of necessity fall to the ground. But I am able to adduce direct evidence to prove, that neither American farming nor American implements raise large crops from exhausted land. The above short extract from Dr Mallet's paper shows at once, that American farming is radically bad, otherwise "the vast extent of 'worn out' Cotton fields already existing even in the most recently settled states" could hardly yet be found under even an approximation to good farming: indeed their Cotton agriculture does not merit the name of farming. But leaving that out of the question for the present, our American planters after five years Indian experience, honestly admitted that they had nothing to teach the natives of India in the business of Cotton growing, but had learned something from them. Our system, they remarked, of sowing on the top or raised ridges, (anglicè lands), with water furrows between, to keep the plants dry at bottom, is injurious in this dry climate; our turnfurrow ploughs therefore, which do not cultivate the ground better or more deeply than the native one, are not required; the only difference between them being, that the one inverts the surface soil, the other loosens and stirs from below, but the seed bed is equally good in either case. I shall consider the second proposition, which I deem a more important one, next week.

I last week directed attention to the fact that in America they were not indebted for their large crops to either the skill of their farming or the superiority of their agricultural appliances, but mainly to the excellence of their soils: in like manner, that the lighter crops of India were neither due to the unskilfulness of the grower nor to the rudeness of his implements, but principally to the poverty and exhaustion to the soil from long continued cultivation. The inference I wish to draw from these statements is that the originators of the Indian cotton experiments fell into a great, but at the time, pardonable error in sup-

posing that the large crops obtained in America resulted not from the excellence of the soil on which they were grown, but from the very skillful farming and superior implements used by the planter: while the lighter crops of India were in like manner attributed to the Ryot's ignorance of farming and the rudeness and imperfection of his appliances, in place of to the poverty and exhaustion of his soil by centuries of cultivation. Subsequent experience and comparison of results have demonstrated the fallacy of both these deductions by showing that the American planter when sent to compete on equal terms with the Ryot had no chance; the latter turning out by much the more scientific farmer of the two, raising on fields side by side, with the planter, as heavy crops and of as good staple, at half the cost; maintaining meanwhile the fertility of his land by judicious culture and rotation of other crops. The American on the contrary at once exhausted what little fertility his land retained by successive cropping, as if it were fresh prairie land till then untouched by the plough. This proceeding coupled with the remark of Dr. Mallet as to the vast extent of "worn out" Cotton fields to be met with all over the Southern States, but too well proves that the men who grew the great crops of Mississippi were after all but tillers of the ground, not farmers; being unacquainted with the very first principle of sound farming, that of husbanding to the utmost the fertility of the land they cultivate; in place of which they, like reckless spendthrifts, lived on their capital as long as it lasted, and when all was gone looked out for fields to be similarly exhausted. I have deemed it advisable before entering on the consideration of our second proposition to call attention to these striking differences between Indian and American Cotton farming and farmers in the hope of guarding any of our enterprising countrymen who may think of engaging in the occupation in India against the prevalent error of supposing that the "agriculture of Hindoostan is essentially rude and primitive; that their implements are most inefficient; that as to the use of machinery, the proper rotation of crops, the application of manure, the choice of seed, and, in fact, the entire round of culture, the natives are deficient." None of all this is really the case. They know their climate and the qualities of their land; their implements as I shall by and by show are not inefficient; their machinery is simple, but so far as it goes effective; rotation of crops they practise, as to its propriety or otherwise I venture no opinion, as I do not know it, but hope the writer who impugns its fitness will explain its peculiarities and point out its defects. In the application of manure they are perhaps not so liberal as they ought to be, but that they understand its application and value

is well shown in their Tobacco culture, but more on this point by and by; in their choice of seed, I had opportunities of learning that no English gardener even is more fastidious. I became acquainted with these things during the 13 years I was engaged in growing Cotton among them. I hesitate calling it farming, and think I am in a position to warn any young English farmer who may think of testing his knowledge by competing with them, that he will soon find them much better farmers than we, judging from appearances only, are disposed to give them credit for, an assertion annually verified by the large crops they contrive to raise from their improverished land with the humblest means and most stinted outlay. I would further add, before quitting the subject, let no Englishman attempt to compete in native products, for he will be sure to be undersold. The better plan is to take the Ryot into a sort of partnership—induce him to grow and buy the produce. You will find it a more profitable plan than to cultivate for yourself. If you can teach him a better method of procedure within his means, I always found him an apt scholar. Our second proposition is to the effect, that the writers quoted last week are of opinion, that without European energy, intelligence, mechanical skill and science, India never can replace America in supplying Europe with Cotton. To this conclusion, taken in the sense I believe the words are meant to convey, and which most people will attach to them, I am not a convert. On the contrary I feel quite convinced that, so far as providing the raw material, apart from ginning, baling, and transport, is concerned, India is quite competent to supply the wants of Europe, were they even much greater than they are, provided the consumers, that is, the "Cotton interest," will only establish and maintain a steady demand for the article. India can supply any quantity, and I think I may almost add any quality, but it must be sought for and bought on her own fields from year to year, not stored to wait a chance demand like the present. Let the demand be steady, and the supply will be ample, regular and cheap. In place of the high sounding words, "European energy, intelligence, mechanical skill and science," let us substitute European capital in the hands of judicious kindly tempered buyers, who know how to practise the virtue of doing as they would be done by in their intercourse with the timid retiring Ryot, and India will give you Cotton enough, very nearly not absolutely as good as America supplies. The *Times* of the 24th October oracularly informs us that "with Anglo-Saxon skill, enterprise, and money, Indian soil will yield the desired fruit." I do not very well understand the meaning of this high sounding sentence, but fancy that it is intended to inform us that

if we will only transport high farming to India, then Indian soil will yield us abundance of excellent Cotton. If this be its meaning, I think it may at once be accepted as a truth, but when may we look for the fruit? Energetic, skilful, and scientific farming will doubtless restore fertility to the most exhausted soils, but it requires time—several years at least; whereas the call for Cotton is immediate and most pressing, and we can't wait for the slow operations of scientific farming, so must, for the present, take what we can get, asking no questions. But let us suppose that European high farming has been introduced, and wherever tried has done its work of so perfectly restoring fertility, that each acre as on the virgin prairie land, produces its 400 lbs. bale of Cotton; then a farm of 1000 acres, on a fourcourse rotation, gives only 251 bales requiring 16,000 such farms, each of course under the direction of a first-class farmer, to provide the 4000,000, bales needed for the present European consumption. England might find difficulty in providing so many first-class farms to grow cotton, but could easily separate two or three thousand commercial travellers to purchase the raw material produced by probably 16,000,000 growers, and afterwards resell part of it to them in the shape of manufactured fabrics. This I presume will be found the more feasible mode of proceeding, and if diligently followed out England need never again feel the want of Cotton as long as India remains a British dependency. Let it not be for a moment supposed that I wish to discourage the most assiduous endeavours, by every conceivable means, to improve both the productiveness of the plant and the quality of the staple. On the contrary I would suggest, as one means of helping on the inquiry, that our commercial travellers should, as much as possible, be taken from the agricultural classes. Young men qualified by taste, habit, and education, to devote their leisure to the culture of a small farm and garden, the former to be cultivated according to the most scientific and approved course of rotation and manuring, the latter being always at hand for experiments on irrigation, hybridization, &c., and for improving and confirming, by separate careful cultivation, any promising varieties or sports chance might throw in his way, either in his own fields or in those of his neighbours. Next week I shall consider the implements and style of cultivation of the two peoples.

I last week directed attention to the general character of Hindoo farming, and by comparing the continued productiveness of Indian soils, after centuries of constant cropping, with the vast tracts of Cotton lands in the Southern American States "worn out" within little more than 50 years, arrived at the conclusion that it is a great mistake to

condemn Indian agriculture as being in a "miserably backward state," and showed by the comparison that whatever may be the shortcomings of the Ryot as an agriculturist, that he, rather than the planter, demonstrates the truth of the axiom "that there must be good farming if you are to have a continuance of good crops, Cotton offering no exception to the rule." We have now to consider their implements and mode of using them. Those the planters brought to India as the essentials of their cultivation were a plough, a small harrow for covering the seed, and a hoe. Gins and presses for cleaning and packing have nothing to do with cultivation. The plough was the usual turn-furrow in use in the country, cutting a furrow of from 4 to 5 inches deep; the hoe is also much the same as ours, but larger and heavier, and made of better material, being cast steel in place of iron. The harrow was a small triangular machine, just enough to cover one drill at a time. Whatever we may think of American farming, viewed in the higher sense in which I have throughout used that term, their tillage is unquestionably excellent. With the plough the field is divided off into narrow lands well raised in the centre, and with a deepish water furrow on each side, the object being in their humid climate to keep the roots sufficiently dry. The lands vary from 4 to 6 feet in width, according to probable size of the plant to be grown on them. If they have a slope—the side of a hill or a circular rising ground—to cultivate, the ridges are conducted across the slope or round the rise to prevent the water running off too fast, the plant requiring a rather moist soil. When the ploughing is finished and the field ready for sowing, it certainly has a most finished appearance. In our practice a native plough, drawn by a single bullock, was run along the crown of the ridge to form a drill for the seed, which when sown were covered in the usual way. In due course the seeds germinated and made their appearance in eight or 10 days. When two or three proper leaves were developed, the hoe came into use, and the crop was "set out"—that is, superfluous plants were thinned out and weeds destroyed, just as we do in this country with our root crops. These operations are repeated as required until the desired "stand" or plant has been attained. This done, the plants being now 6 or 8 inches are bedded up, that is, ridges which had been flattened by hoeing and treading down, are renewed by the plough. After this nothing beyond an occasional touch with the hoe to remove weeds is required for that crop. The picking or harvesting the crop is the same in both countries, and is done equally well in both, the Hindoo having nothing to learn from the planter. The Hindoo implement of culture, for they have

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but now, is the much despised and, I must admit, despicable looking "crooked stick," but which, measured by its efficiency as an agricultural tool, not by its appearance, placed side by side with a Ransome or Howard, still less with a Smith's steam cultivator, is by no means the despicable implement it seems. It is made of the hardest wood, usually an *Acacia*, strengthened and pointed with a bar of iron 18 or 20 inches long and about half an inch thick, let into the pole. The beam is so set, that by shortening or lengthening the point of attachment to the bullocks, they can vary the depth of the furrow from 1 to 8 inches or even more in light land. If we designate our implement a plough, then the native one is more properly a cultivator, for the point enters the soil and, as it were, works from below up, stirring and loosening it to the depth it goes, bringing all weeds and Couch to the surface, and covering none by inverting the soil; in one word, it is simply a one-tined grubber, and as such an instrument of great power. This simplest and most ancient of agricultural implements becomes in the hands of the patient and industrious Ryot, long accustomed to its use, one of marvellous efficacy in loosening and pulverising the soil and destroying weeds by leaving all that it displaces to wither on the surface, burying none. In his skilful hands it performs the functions of a plough, a grubber, and even a harrow! for covering his seed. The Hindoo practice is, as much as possible, to fallow his lands after every crop. This he accomplishes by ploughing after every considerable fall of rain. His crops are usually harvested during the dry season, when the land is baked as hard as a brickbat. To plough then is impossible, but should a thunderstorm or chance fall of rain happen, so as to soften the soil but a couple of inches deep, it is immediately stirred to that depth, and these stirrings are repeated as often as opportunities offer until the proper sowing season. In this way it is often well pulverized to the depth of 6 or 8 inches long before the time for sowing arrives. Should he be prevented by the want of rain or other cause thoroughly fallowing in that way, a less perfect one becomes almost indispensable, which he calls "cooling" the land, that is, alter ploughing as well as he can he lets it remain in its loosened state exposed to the free action of the sun and atmospheric influences for a month or longer. The fertilising effect of this "cooling" is so well understood by the Ryot that he never willingly sows his field without that preparation. Thus prepared and the proper sowing season having arrived, he takes advantage of the first showers to give his land a final turn and sows his seed. When small he covers it by dragging a bush over it, but larger ones like Cotton are more frequent-

ly covered by running the plough very lightly through the ground. In due time the plants make their appearance, and when three or four inches high the field gets its last ploughing to thin out superfluities, and break any caking or hardening of the surface which exposure to alternate rain and hot sun may have caused since sowing, thereby giving the air and dew free access to the roots of the growing plants. This ploughing completes the agricultural operations, with the exception of some partial hoeings. In about 6 or 7 months the harvest begins and as well as I can recollect, in the case of the native plant, is finished in about three weeks. The American one continues much longer. That done, flocks of sheep are usually turned into the field, to eat the leaves and green tops, and manure it for the next crop. If the crop has been badly grown and the plants small, they are left on the ground when ploughed; but if large they are gathered and stacked for fuel in place of, as they ought, being burned on the ground. The fallowing begins with the first rains.

In my last is a summary of Eastern and Western Cotton farming, so far as I know it, doubtless very imperfect, but I believe, so far as it goes, pretty correct. What I have told of the American plan I learned partly from the practice, partly the conversation of the planters who were with us, and may differ somewhat from their home practice, but not much, as it accords with Dr. Mallet's account. My acquaintance with the Indian one is derived from personal observation, I dare say often imperfect and limited, and now written from memory. When first brought in contact with it my belief of its "miserably backward state" was about as confirmed as that of the "Committee of the Cotton Supply Association." until taught my error by finding our "mechanical skill and science" beat by the practice of the Ryots. A good deal of subsequent reflection, especially since I have become sufficiently acquainted with the practice of English farming to be able to compare it with the other two, has satisfied me that the Hindoo system, so far from being so defective and backward as we are told, is in practice, still ahead of our middle class farming. I had no idea that their rude and primitive plough acts on precisely the same principle as the English grubber, or Mr. Smith of Woolston's steam cultivator, until I saw these implements at work and could compare their operations with what I had seen the Indian plough effect in breaking up waste lands preparatory to using the American one to finish the cultivation. The Black Cotton soils in some districts of India are infested with a most intractable kind of Couch, to remove which an implement of proportionate power is required. For this purpose the

same form of plough is used, only much larger and stronger, drawn by 12 strong bullocks; by which the ground to the depth of 15 or 20 inches, is torn up, in great masses, by main force, or as Mr. Smith would perhaps call it "smashed up," and left to dry and bake in the sun until pulverised, like quicklime, by rain, when the Couch is easily pricked out. I almost doubt whether his machine could do the work more effectually. Mr. Smith, who maintains that cultivator-stirring is far superior to the "turn-over" slice of the plough, in cleansing, pulverising, and fertilising the land, by the free access it gives to the air, is probably not aware of the facts here stated, which seem so conclusively to support his views by the persistent fertility which this mode of tillage appears to have imparted to the old much-enduring soil of India. In like manner the Rev. S. Smith, of Lois-Weedon, if he reads these papers, can scarcely fail to perceive how much his views of the practicability of indefinitely preserving the fertility of land by frequent deep stirring and free admission of the air, are strengthened by Indian practical experience. By that means the Ryots have, for thousands of years, enabled their lands to extract from the atmosphere the greater part of the manure required to support such incessant cropping and still bear such bountiful crops. Chemistry explains the mystery by unfolding the principles by which the particles of the air and soil act and react on each other when brought in contact by good tillage. The following very brief summary of these principles I abridge from the leading article of the *Agricultural Gazette* for Nov. 2. Tillage like guano acts by the actual addition of particles to the soil, and in the one case as much as in the other is the equivalent of dung. Guano, superphosphate, lime, however, act not only as direct additions of the food of plants, but also as reagents in the soil, by which useless or even mischievous matters there are converted into food: so does tillage. The air contains the substance of plants; every process of putrefaction or combustion fills the air with the substance of once living plants; and it only needs that by tillage the soil should be brought, throughout its substance, into contact with fresh surfaces of air, to enable it to extract and treasure up, for living vegetables once more the very atoms which have constituted its fertility before. *Tillage no doubt results in an actual addition of those very particles to the soil, which in guano, superphosphate, and farm-yard dung are called manure.* In England the practice is very different; true the farmer trusts more to manure bodily added and less to tillage and consequent abstraction of carbonic acid and ammonia from the atmosphere. I have often stopped on the road to look at, and wonder in my own mind

what would be the thoughts of an intelligent Ryot, could he only be brought there, on seeing a man, a boy, and four strong horses, yoked—all an end, tandem fashion—to a plough creeping along at the rate of two miles an hour laboriously turning over a furrow slice some 3 or 4 inches thick, the horses meanwhile, as if afraid the admission of fresh air to a lower stratum would do harm—treading the ground over which they walked as hard nearly as the adjoining turnpike. It is not easy to imagine what his reflections would be, but I dare say something to the effect that “these English are very curious people? they must needs use the most costly and powerful machinery, and even steam-engines to do every thing, even common work; they can do nothing in a simple easy way. If I had only my small simple plough, which I could carry to the field on my shoulder, and bullocks here, I think I could cultivate that field deeper and better, and even quicker, though my bullocks, plough and all, if placed in the opposite scale, would hardly balance one of these great horses!” If such were his musings he would be pretty nearly right, the tilth produced by our best and most costly mechanical contrivances being seldom either better or deeper than he can, and generally does, produce with his iron pointed “rooked stick” and small bullocks. If these papers are ever read in India, I hope they may have the effect of inducing Europeans, engaged in agricultural pursuits, to examine with scientific impartiality the mechanical powers and agricultural qualities of that implement. I may be wrong in my estimate, but I can’t help thinking it is despised because of its simplicity as compared with our European implements, though perhaps the better tool of the two. We have now obtained a convenient standpoint from which to take a very brief retrospect of the ground over which we have travelled, before entering on the final and most important branch of the subject—the improvement, namely, of the productiveness of the plant, and the staple for which it is cultivated. We have seen that though America yields the larest crops of the best Cotton, she is certainly not indebted for this pre-eminence to the excellence of her agriculture, as it failed to maintain its credit when tried in India. Further we found her agriculture defective, inasmuch as the agriculturist, so to speak, lives on his capital in place of his interest, speedily exhausting the fertility of his land. The Hindoo we have seen, to carry on the simile, lives entirely on his interest, but seems to have but an imperfect idea of adding to his capital by combining systematic and liberal manuring with his laborious and careful tillage. The English agricultural system, so far as the most passing glance enables us to judge, differs considera-

bly from both, from the former in minute attention to rotation; and from the latter in constantly adding capital—manuring abundantly—but owing, apparently, to less perfect tillage, drawing out almost as fast as it invests, receiving little interest from its banker. The problem therefore to be solved is how to combine the Hindoo and English systems in Cotton culture. This question I shall endeavour to solve in my next letter.

The conclusions to which our examination of the Indian Cotton cultivating experiments, as carried on at Coimbatore, lead are few and simple. First we learn that the American method, however perfect as regards tillage and agricultural art, is wanting in science, and although applicable, at least for some time, to the virgin soils of America, is altogether unsuited to those of Southern India. This inference seems fully established by a trial continued through 13 years, in the course of which we learned that the Ryots of India with the simplest of simple means raised as good crops and of as good Cotton as the American planters could do with their much more costly and laborious procedure. Secondly, we learn that Indian tillage, though executed with the most unassuming and primitive of implements, is far from being so defective as, judging from the appearance of the tool, we should at first sight suppose. This is owing to the full effect being produced not by going once or twice over the ground as we do, but often five or six times, increasing the depth each time; and never, as in English practice, consolidating the subsoil by the pressure of a heavy plough, and the treading of three or four large horses employed to drag it, walking leisurely along the furrow just made. The effect of these repeated stirrings is to produce a very perfect tilth, allowing the freest access of the air to every particle of the soil. Thirdly, we learn that the Ryot, by following a systematic course of rotation, combined with slight manuring and his excellent tillage, has preserved through many centuries the fertility of his land, while the planter by disregarding that most essential practice has, in a few years, exhausted the exuberant fertility of his—at least so far as Cotton culture is concerned. We have now to enter on a new branch of the subject, which I think may be most conveniently considered in endeavouring to answer two questions, namely—Is it possible within a few years so far to restore fertility to the “worn out” Cotton fields of America as to render their renewed culture profitable? and, secondly—Can the fertility of the Indian “Cotton soils” be increased by the use of manurial appliances, aided, perhaps, by modified rotations, more in accordance with ascertained scientific principles than those now practiced? I limit this question to the properly so called “black Cotton

soils," which are peculiar. All other I know can be so improved. Dr. Mallet remarks, "As to the extent to which they (the mineral constituents) are withdrawn from the soil by cultivation, it may be remarked generally, that Cotton is by no means an exhausting crop under proper management,"—referring of course to the small quantity removed, yet in India we found it a very exhausting crop; but why it should be so, under the circumstances stated by Dr. Mallet, I am unable to say. He informs us, "The great mass of the plant—root, stem, branches, leaves and emptied bolls, remains on the field and is ploughed into the soil, which is enriched by the rapid decay of the organic matter. Nothing is removed except the fibre and seed and a large proportion, if, not the whole of the latter, is by judicious planters returned to the land; Cotton seed is in fact almost the only material used as manure in the Cotton region of America. * * * The Cotton fibre, which constitutes the saleable product, and is absolutely carried off the land, must be looked upon as a very light crop; a bale of 400 or 500 lbs. to the acre is sometimes obtained under favourable circumstances, but this is much above the average for upland Cotton. The fibre yields 1 or $1\frac{1}{2}$ per cent. of ash, so that at the most $7\frac{1}{2}$ lbs. of mineral matter per acre will be removed from the soil annually. According to Johnston (Lectures on Agricultural Chemistry, p. 26), a crop of Wheat of 25 bushels to the acre removes from the soil, in the grain alone, about 17.65 lbs. of mineral matter; a crop of Barley of 38 bushels, carries off in the grain, 46.93 lbs. A crop of Oats of 50 bushels, 53.05 lbs. According to Liebig, (Letters on Modern Agriculture), an average crop of Potatoes removes from each acre about 163 lbs. of mineral matter; and one of Beet about 458 lbs., leaves included." The fact, therefore, of Cotton removing so small an amount of mineral matter, as compared with these, is to me an interesting one (for such I presume we may consider it), as going far to prove that, in the case of Cotton and possibly all other crops, the sterility caused by consecutive cropping with the same plant is not simply attributable to the amount of mineral matter removed from the soil. In India our crops were occasionally so luxuriant that the planters assured us they were quite equal to Mississippi ones, but the falling off the second year was most conspicuous, and the third was scarcely worth picking. This occurred repeatedly during the first 4 or 5 years of our pupilage under American tuition, and of course led to the discontinuance of that mode of procedure. The point which claims attention is, that while Dr. Mallet on, I presume, theoretical grounds—or because nearly the whole of the vegetable matter of the crop is returned to the soil—considers cotton by no means an exhausting crop, he

yet informs us that the vast extent of worn-out cotton fields already existing in even the most recently settled cotton States is such as "must compel, there and elsewhere, the attention of the economist to the scientific aspects of the problem of Cotton cultivation." The discrepancy between these two passages seems to indicate that, at least in this instance, theory and practice are at variance; the Cotton plant as shown by both American and Indian experience being in truth a very exhausting one when cultivated according to the American system. But, on the other hand, when managed according to the Indian one, that is, as one of a rotation, its exhausting tendency appears to be so far counteracted that it ceases to be more injurious to the soil than other crops, and has in consequence retained its place in their agricultural system for centuries; seemingly without causing any material deterioration of fertility. After what I have repeatedly witnessed when engaged in Cotton culture, combined with Dr. Mallet's previous statement as to the vast extent of worn out Cotton fields, I cannot but hesitate accepting his deduction as to the non-exhausting character of this crop on the grounds stated. It is on record that the fertile soils of Virginia bore for a century continued cropping with Wheat and Tobacco, without manure, before they ceased to produce remunerating crops, whereas scarcely half that time has elapsed since the Southern States of North America became the great Cotton field of the world, and already half their extent consists of "worn-out" Cotton fields, and that, too, notwithstanding 9-10ths or more of each crop is annually returned to the soil which produced it. Whether other crops similarly cultivated, and year after year returned to the soil in the same proportion, would equally induce sterility, is more than I can say, or perhaps than is known, or likely to be known, except experimentally on a small scale; but it is a question meriting careful consideration before fully adopting, as proved, the chemical theory of exhaustion of the soil. Should the experiment be made, and the result be at all in accordance with what is known regarding Cotton culture, it will, I think, go far to prove that that theory requires revision, and that the more or less exploded one of poisonous excretions may to some extent at least, be again taken into favour. I lay stress on these matters now in the hope that Dr. Mallet, should he chance to see these lines, may be induced to take them into his consideration when examining "the special mineral food required by the Cotton plant, and the amount of this food, both of which remain to be examined by analysis of the ash, and will form another part of the investigation." Of all our agricultural chemists, fortunately now with numerous and skilful, he seems by far the most favourably situa-

ted to investigate this interesting question, and if he does so with the untiring patience and skill he has already bestowed on the soil *per se*, we may, I think, expect it will be definitively ascertained on unquestionable evidence that part at least of the benefits derived from rotation is due, not simply to one set of plants living on food left by those which preceded them, while fresh supplies are being generated by agencies at work in the soil, but is in part attributable to their feeding on the excretions of their predecessors. The excretions of Beans are supposed to nourish the Cereal crop which follows them in rotation, while those of the Oak are so injurious that most other trees, planted on the site whence it has been removed, will not thrive though food suitable for their nourishment abounds. The excretions of the Poppy, too, are said to contaminate the ground for many other plants. May not the Cotton plant in like manner poison the ground for itself, long before it has exhausted the inorganic constituents on which it lives, while like Beans actually enriching it for other crops, which in the course of a few years, by consuming the deposit, reprepare it for fresh Cotton crops, as happens in the Indian plan of culture? May not our Clover and Turnip sickness, the causes of which are still a mystery, be referable to a similar origin, differing only in requiring a longer interval and more varied rotation to effect its removal from the soil through the agency of other crops? A careful analysis and comparison of "worn-out" with fresh virgin soils may perhaps enable so skilful an analyst as Dr. Mallet to throw some useful light on this obscure but most interesting and important subject of inquiry, and also enable him to aid the investigations of our chemists in their hitherto nearly fruitless endeavours to discover the cause of our Clover and Turnip sickness. Lastly, let us hope that the researches may result in suggesting such a course of cropping as will not only preserve fertility in new lands, but restore it, by a speedier process than that followed by unaided nature, to the already "worn out Cotton fields" of the Southern States of North America.

Can the fertility of the "Indian Black Cotton Soil" (Regar of the natives) be increased by the use of manurial appliances; aided, perhaps, by rotations more in accordance with scientific principles than those now in use? I say, perhaps, because I am uncertain whether science would not confirm those now in use as the best that could be devised. This is the second question proposed in my last letter, only somewhat differently stated. I purposely limit it to the Regar or Black Cotton soils, which though little variable in appearance and properties, yet do vary enough to justify the use of the plural number in regard

to them. These soils have at different times engaged the attention of Geologists, Chemists, and Agriculturists, but more especially of travellers having to traverse them during wet weather. The Geologist is disposed to consider them disintegrated trap rocks, but is somewhat startled at the thought of their vast extent, extending as they do over many thousands of square miles of surface. To this difficulty I will venture to add the fact of their being often penetrated by bluff, almost perpendicular masses of syenitic rock, rising like islands out of the sea, sometimes to the height of several hundred feet, and wide enough to become, in former days, sites of strongholds of troublesome and mischievous marauders; the disintegration of which forms a soil totally different from the surrounding Regar. The Chemist in like manner is perplexed by finding on analysing several specimens from different parts of the country, considerable differences of composition, though usually agreeing pretty well in a few prominent points, such as the small quantity of vegetable matter, and in the proportions of carbonate of lime and siliceous matter it contains. The Agriculturist wonders at while heartily rejoicing in their perennial fertility, bearing as they do, without manure or other appliance, beyond what his plough and hoe supplies, annually one or two crops, due attention being paid to rotation. That (rotation) the Ryot in the case of Cotton declares quite indispensable, but is, so far as I know, the simplest kind, namely Cotton, then two successive crops of Sorghum (Jowarie or Cholum of the natives), and Cotton again. The first Sorghum crop after the Cotton is usually very abundant, and is looked forward to with particular regard; hence the floating tradition that exists in some parts of the country, of a Ryot, who feeling himself dying, bitterly upbraided Fate for its injustice in depriving him of what he had been looking forward to in two or three years, namely his large crop of Sorghum. Lastly, the Traveller, overtaken by wet weather in the midst of one of these Regar districts, I can readily suppose wishing the blacking mud at the bottom of the Red Sea, or anywhere else than where it is, for being intensely hygro-metric in its properties, it becomes so adhesive when wet, that it sticks to everything that comes in contact with it, and is so soft that every weighty body, man and beast, sinks into and sticks in it. This deposit, which our Geologist deems of diluvial origin, but which must be of much older date, varies greatly in depth, seldom less than 2 feet, but sometimes as much as 10 or 20, resting on a calcareous marly stratum, which by the way is in some places largely dug for road making, being the only material for miles together available for the purpose, and where the traffic is not very heavy makes very passable roads. In dry hot

weather the substance condenses and contracts apparently to little more than half its bulk, and forms cracks in all directions, many of them several inches wide, and 12 to 18 inches deep, so as to make it dangerous to ride over the ground even at a pace. To this property they to some extent owe their fertility by the admission the cracks afford to the air, it being an observation sometimes made, that when the dry season has not been broken by unseasonable rains, causing the ground to crack freely, the following crops are generally good, owing I presume to the double effect of first aerating the soil and then saturating with water, by the cracks getting filled by the first heavy rain before the swelling and puddling of the surface prevents further admission. These soils are naturally so fertile that all kinds of crops thrive upon them, and have done so for ages without manure or rest, but when subjected to the American plan of consecutive cropping with Cotton they became "exhausted" in three years, in spite of the most assiduous cultivation. To these soils my question refers, and it is asked rather with the intention of directing attention to their peculiarities than for the purpose of suggesting an answer, which I admit I cannot give to my own satisfaction. I know that so far as I had an opportunity of observing, the Ryots never applied manure, beyond allowing sheep to browse the leaves and tender tops of the Cotton plants for a day or two before clearing off the shrubs, and equally that they did not manure their Cotton fields, but it never occurred to me to enquire whether it was purposely withheld, on the supposition of its being injurious. Subsequent reflection on this point of their practice, strengthened by the analogy of other crops, goes far to convince me that, however well the Cotton soils may do without manure, that they would do better if cultivated on principles of higher and more scientific farming: that is, good tillage, systematic though moderate manuring, and carefully adjusted rotations. The rotations might be easily enlarged, as I think with advantage, as nothing in the shape of annuals seems to come amiss to them. If in place of the three course one given above, a four or five course was adopted, consuming at least one on the ground by sheep, or ploughing in a green one, the others would, I expect, considerably benefit by the change. Our trials however extended to all kinds of soil within our reach, and as a general rule we found that land which had not been under Cotton for some years generally yielded fair returns, in average seasons, for at least one crop; the second when attempted always disappointed us. The plan of trying Cotton on all kinds of soil, and with, upon the whole, very uniform success proves that the plant is by no means fastidious in the matter of soil.

ter than the favourable conditions under which he planted, and that the disappointment of both the projectors and planters with the result was unreasonable, since a little reflection should have shown that it was impossible to be otherwise. But on this point misunderstanding still exists, as is clearly proved by the imputation of intentional *mala fides*, ascribed to the parties engaged in working out the experiment, and its consequent predetermined failure. As this imputation comes from a highly respectable deliberative body, representing the great "Cotton interest" of Manchester, I have made it my endeavour to combat it by a variety of illustrations, scattered over the whole series of letters, rather than by hasty repudiation, or, what would have been worse, allowing my feelings, as a principal actor in the business, to get the better of my judgment, so far as to elicit undignified replies. As I think it must be clear to that body, if they read these papers, that they do us a great injustice, I still expect to see the offensive charge publicly withdrawn and apologised for. I have repeatedly referred to the fact of our having cultivated American Cotton on all kinds of soil and with wonderfully uniform success, the crops varying somewhat in quantity, but scarcely perceptibly in the quality of the staple. This I have done to show that the plant is far from being fastidious in the matter of soil, though it is quite clear it luxuriates in a rich one, as shown by the great difference of American and Indian crops under precisely the same culture. Finally I have dwelt much on the circumstance of our having found it a most exhausting crop, requiring careful rotation towards its successful culture, which rotation not being an American practice has led to the rapid exhaustion of their rich soils and their great extent of "worn-out" Cotton fields, while its regular adoption in India has preserved those of the Ryot comparatively uninjured—deducing from these facts the conclusion that by combining the English practice of judicious manuring with Hindoo tillage and rotations, the fertility of the Indian soils might be made to approach those of the Southern States of America, and to produce proportionate crops. We can scarcely hope to improve the staple of American Cotton in India, but I think it highly probable that by such a course of farming both the quantity and quality of that of the native plant may be improved. This brings us back to our original question—Can the productiveness of the Cotton plant and the quality of the staple for which it is grown be improved in India by "high farming?" To this question I believe only one answer can be given, and that in the affirmative. But we have, before going further, to settle the true import of the term "high farming," as applied to Cotton. I have already mentioned that the

Ryots do not manure their Cotton, and that I did not know whether it was purposely withheld as being injurious, or from indolence and poverty. If the former, then high farming as applicable to Cotton must be very different from what we understand it to mean when we apply it to our root crops. But still it may mean the same thing as when we use it with reference to the whole rotation of the farm. Be that as it may, an application it must have, as Cotton though not particularly dainty likes a good soil, and surely can, through the combined operations of science and agricultural skill and experience, be discovered. Our experience on many occasions proved that the soil exerted greater influence than climate, different fields yielding very different crops the same season. Such being the case, skilful farming, by progressively improving the condition of the land will go far, I expect, to place India on a par with America, and that is what is wanted. In agricultural circles it is no very uncommon occurrence in course of conversation, to hear of good farmers having taken farms spoken of as being "not worth 5s. the acre," and who contrived in the course of four or five years to make them worth 20s. or 30s. the acre. Without insisting on such commendations being true to the letter, I have no hesitation in accepting them as near enough the truth to show the high estimation in which the men spoken of are held for their skill and knowledge of farming. These then are the kind of men wanted to initiate the scientific culture of the Cotton plant in India: men able to teach, but still not too proud to take lessons themselves. And my conviction is, that even such men would learn something worth the trouble of the study required to learn it from even the despised Hindoo Ryot. Hitherto the nature of Indian land tenures has been adverse to Europeans locating themselves in the country, except as agents for purchasing from native growers; hence the recommendation of a former letter, to confine themselves to that occupation, merely renting small farms with a view to the introduction of European farming in its most perfect forms, to convince the natives that they were still behind us. Since the publication of that letter, our position in India is totally changed. The European can now acquire land in fee simple, with the untrammelled right of improving his property according to his own fancy. A capitalist can now locate where he pleases, farm his own land, set up machinery on it powerful enough to clean and bale all the cotton grown within 20 miles of him, enter into contracts with every grower within that range to purchase all the Cotton they can grow as it comes from the field, paying on delivery, he giving them the seed. On such terms I for some years purchased as much Cotton as I could gin, and never, during the whole time, had a difference with one of the many hundreds who dealt with us. In this way he could always be answerable for the quality of every bale that left him. A farm of 500 or 1000 acres might easily be managed along with such an agency, and very profitably if he found that he could make his rotation crops pay the cost of farming, having his Cotton for profit, and that I think he could easily accomplish. Indigo, Tobacco, Jute, oil seeds, are all exportable articles, while there is an endless list of cereals and pulses, of quick maturity, suitable for food for labourers, for fodder and litter for cattle, and for feeding off on the field by sheep, furnishing among them abundant material for manuring and enriching the ground. The well-fed stock would, besides, yield very profitable returns, good mutton being in great request in India, and difficult to be had. Under such management average land, I feel almost certain,

could in the course of a few years be made to yield crops of Cotton nearly, if not quite as large as those grown in America, with the difference in favour of India, that the soil was yearly improving in place of wearing out. Cotton, like all other cultivated plants, is liable to variation, crosses, and sports; these if carefully sought for and subjected to separate cultivation, annually selecting forms promising special excellence, would likely reward the attentive observer with varieties as much excelling the general run as the very promising Pedigree Wheat excels the other varieties of that invaluable cereal now in general cultivation. Hitherto the very facility of growing Cotton—now become one of the most valuable of cultivated plants—has deprived it of the care and nurture bestowed on hundreds of other plants of comparatively little value. Those days are now, I believe, gone by; the temporary interruption of the supply and breaking up of the great American monopoly has opened the eyes of the “Cotton interest” to the injudiciousness of trusting to any one country for some 70 or 80 per cent. of our supplies of this indispensable article, and has taught them the necessity of securing steady and unfailing contributions from every available quarter. The world at large, so largely dependent on British looms for their clothing, now appeals to the Cotton zones to furnish the raw material whence the cloth is fabricated, and doubtless, for their own sake as well as for ours, the appeal will be heartily responded to, if only equal encouragement is accorded. No doubt many difficulties and impediments lie in the way at first starting, for though the Cotton plant is the easiest of plants to cultivate, yet the staple is a bulky and costly article to prepare and send to market. But that difficulty will doubtless soon give way before the great mechanical ingenuity of this country, especially under the stimulus of remunerating prices. I here close my remarks on the Cotton culture of India; the development of principles, drawn from personal experience, not details of practice, which must be adapted to each locality, being my object. I have not ventured to touch on irrigation as applicable to Cotton cultivation, for the simple reason that I have had no personal experience of its effects or management, and might mislead were I to attempt to teach that which I only know from others, or have learned from books accessible to all. My own impression is that it is unsuitable to the short stapled varieties, but that is a mere surmise on my part. *Robert Wight, Grazeley Lodge.* (*Gardeners Chronicle*, November and December, 1861.)

the seed should be explained by the party with whom the failure occurred. This is very essential, for it is important to know the cause of failure, as people are too apt to blame soil or climate when their own want of knowledge is to blame. One of your recipients complained to me that he had sown some hundreds of beghas with New Orleans seed, and he was dreadfully disappointed at its total failure. On asking how he had sown it, he told me that by the advice of a native he had first steeped the seed in hot water."

The Secretary intimated that the circular letter suggested by Mr. Saunders would shortly be forwarded. In the mean time he might mention, that he had heard of several failures of the seed in question, (New Orleans, which was received through the Cotton Supply Association,) and also a few reports of success, including that of Mr. Powell, of Shaj-hanpore, which was submitted at the last meeting. The trial in the Society's Garden gave only a partial germination.

Read a letter from Mr. R. W. Bingham, of Chynepore, enclosing copy of an interesting communication addressed by him, in reply to a requisition from the Commissioner of Patna, respecting certain staple productions of the district. Transferred for publication in the Journal.

Letters were submitted from Messrs. Villet and Son, of the Cape, and Messrs. Carter & Co., of London, advising despatch of supplies of vegetable and flower seeds respectively.

These seeds have been received and are now in course of distribution.

The Secretary placed on the table a few copies of the pamphlet in Bengali, to which allusion was made at the last meeting, entitled *Krishi Patha*, (agricultural readings) compiled for the Society by Baboo Peary Chaud Mittra. One thousand copies of this useful work have been struck off.

For all the above communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 9th of October, 1861.)

W. G. Rose, Esquire, Vice President, in the Chair.

The Proceedings of the last General Meeting were read and confirmed.

The following gentlemen, proposed at the last Meeting, were duly elected Members :—

Messrs. George Oran, H. C. Friske, James Davidson, H. W. Alexander, C. S., Henry E. Hannay, J. H. Reily, Major A. F. Baird, Captain H. W.

Manning, Captain Malcolm Lloyd, Helmer Devenanth Mundle, and Roy Nandipatt Muhta, Bahadoor.

The names of the following gentlemen were submitted as candidates for election :—

W. Macpherson, Esquire, C. S., Mootacharree,—proposed by Mr. C. Hollings, seconded by the Secretary.

Maharajah Luchmessur Sing Bahadoor, Mozuffierpore, Tirhoot,—proposed by Mr. James Forlong, seconded by Mr. W. G. Rose.

Archibald Campbell, Esquire, Extra Assistant Commissioner of Assam, Burpetah,—proposed by Colonel Francis Jenkins, seconded by Mr. C. A. Cantor.

Captain William Neembhard, Deputy Commissioner, Jubbulpore,—proposed by Major A. Impey, seconded by the Secretary.

James Parker, Esquire, Superintendent Ganges Canal, Meerut,—proposed by Mr. F. Reid, seconded by Mr. C. B. Wood.

John Power, Esquire, C. S., Moradabad,—proposed by Captain James Williamson, seconded by Dr. A. H. Hilson.

Captain H. T. Pollock, Indian Army, proposed by Mr. T. E. Carter, seconded by the Secretary.

The following presentations were announced :—

1. Memoirs of the Geological Survey of India, Vol. III., Part I.; and Annual Report of the Survey. Presented by the Government of Bengal.

2. The Annals of Indian Administration, Vol. V., Part III. Presented by the Government of Bengal.

3. An account of the Quinquine plantations in the Island of Java. Presented by the Government of Bengal.

4. Reports of the Administration of Pegu, Hyderabad Assigned Districts, Oude, Tenasserim and Martaban Provinces, Straits Settlements, and the Madras Presidency. Presented by the Government of Bengal.

5. Evelyn on Forest trees (1 vol.), and England Illustrated, (2 vols.). Presented by Captain W. H. Lowther.

6. A Wardian case of Australian plants and a collection of Australian seeds. Presented by Dr. Mueller, Director Royal Botanic Garden, Melbourne.

The case containing this fine collection of plants has, unfortunately, received such bad treatment in transit, that the whole of the contents have arrived perfectly dead.

7. Some seed of the Manilla hemp plant (*Musa textilis*). Presented by G. H. Thwaites, Esquire, Director of the Royal Botanic Garden, Ceylon.

8. A few of the fine Norfolk Island Potato. Presented by Captain Thomas Hill, Assistant Master Attendant.

9. A collection of seeds of annuals, of vegetables, and of ornamental trees and shrubs from the Cape of Good Hope. Presented by Captain W. H. Lowther.

Reports were submitted by the Gardener, on the germination of the Cape vegetable seeds and seeds of English field crops. Of the former, 19 kinds have germinated freely, 4 partially, and 8 have failed. In respect to the latter, the Gardener observes thus: "The statement shows that a considerable portion of the seeds detailed have germinated in a satisfactory manner; but it is also necessary to state that a considerable portion of the seedlings subsequently died off after attaining the height of one or more inches, owing to want of proper shelter, or security from the excessive dampness and moisture of the atmosphere." Both reports were referred to the Garden Committee, in connection with orders for next year's supplies.

Cotton.

Read the following report from the Cotton Committee relative to the comparative working of Macdonald's and Dunlop's patent roller gins:—

REPORT OF COTTON COMMITTEES ON DUNLOP'S AND MACDONALD'S ROLLER GINS FOR COTTON.

"Resolved, that the Cotton Committee be requested to test the working powers of this machine [Macdonald's] with Dunlop's, and to communicate the result to the next Meeting." (General Meeting of 14th August 1861.)

"In accordance with the Resolution noted in the margin, your Committee beg to report the working power of the machines referred to, from a trial made at a meet-

ing held on the 17th August.

"The quantity of cotton cleaned in half an hour by Dunlop's machine was fourteen (14) tolas, and by Macdonald's, in the same time, thirty-nine (39) tolas. Each machine was turned by two hands and fed by a third.*

"The *Kupas* (cotton with the seed) experimented on was a portion of that procured in 1852 from either Madras or Bombay to test the capabilities of the machines which were then submitted to compete for the Government prize of 5,000 Rupees, and is consequently nine years old.

* In the Report of trials made with this and other machines at the Office of the Cotton Supply Association on the 4th October 1859, it is stated that Dunlop's machine turned out as much as 55 lbs. clean cotton in 10 hours. It is not mentioned with what kind of cotton the machines were fed, whether long or short staple.

"The cotton was more effectually freed from the seed by Macdonald's than by Dunlop's machine. It is probable that both would give a larger proportionate return of clean cotton after a few hours' continued working, than is shewn in the above return of half an hour.

"The first cost of Dunlop's machine at Manchester is £3, and with freight and other contingent charges added, would cost in Calcutta about Rs. 35. Mr. Macdonald estimates the cost of his machine at about 100 Rupees in Calcutta, if made here; but he thinks it could be made a good deal cheaper in England.

"The improvement' in Macdonald's Gin consists 'in the addition [to Dunlop's Gin] of a roller made from compressed cocoanut fibre, and also the addition of a fan brush fly wheel, and box to receive the cotton from the fan brush; there are also improvements in regulating the spring knife and in using the springs over the keepers.'

"Assuming the relative prices of these machines at Rs. 35 and 100, and the out-turn of clean cotton in half an hour at 14 and 39 tolas (39 tolas is about one lb) respectively worked and fed alike, Macdonald's must be considered comparatively dearer than Dunlop's.

"Jameson's Cottage Saw Gin' was also tried at the same time, and the result was 15 tolas of indifferently cleaned cotton: one man turning, and one feeding the machine.

"The above report was submitted at the meeting of the Council held on the 5th September, when it was considered desirable that another trial should be made with fresh cotton. Accordingly, your Committee met again on the 19th September and had the machines fed with *Kupas* raised in the Society's Garden in 1858, from New Orleans seed.

"The quantity cleaned in a quarter of an hour by Macdonald's machine was eleven tolas, and by Dunlop's four tolas. Each machine was, as before, turned by two persons, and fed by a third.

"It was then agreed, at the suggestion of Mr. C. E. Blechynden, who was present on the occasion, to work Dunlop's machine with a slight addition, by which he stated he had obtained a much larger return from a Dunlop's machine when worked at Burhee, than that exhibited above. The time employed was five minutes, and the result was five tolas of clean cotton against three tolas from Macdonald's machine. As this result proved so very much more satisfactory than previous trials of Dunlop's machine had

done for it; your Committee think it desirable to introduce a memorandum from Mr. Blechynden on the subject:—

“ ‘With reference to Dunlop’s Cotton cleaning Gin, I have found it of great advantage, as recommended in his instructions “how to work the machine:” to put two slips of wood, two-eighths of an inch in thickness, under the head plate at the back of the screws, so that when the screws are tightened down the head plate falls in a slope forward; by this means the “doctor” is brought into better and closer contact with the roller, and admits of being easier regulated by merely tightening or easing off the screws of the head plate till the machine works freely and draws the cotton well on every part of the roller.

“ ‘I have further found great advantage in the feeding of the roller, by using a piece of tin, cut to the size of the feeding frame, and placing it at an angle of 45° with a space of $\frac{1}{4}$ of an inch at bottom from the roller. This enables the person feeding to give a constant and certain supply to the roller, for as soon as the cotton is placed on the inclined plane it finds its way to the grated bottom, and is brought into contact with the roller, and thus drawn in.’

“ Your Committee are doubtful whether the substitution of a “roller made from compressed cocoanut fibre,” for the present smooth leather roller of Dunlop’s machine, can be considered an improvement. The object which it would appear desirable to attain in the roller, is a rough surface but a yielding one, without harshness; such is not the character of cocoanut fibre, hardened further by compression. It would, perhaps, be desirable, when the leather-covered roller of Dunlop’s machine does not draw quickly, to roughen the surface with a new file, making the roller revolve in the direction it would turn when at work. The revolving brushes may be an improvement, but here again the substance used appears to be too hard: softened brushes would probably answer better.

“ On subjecting the two samples of clean cotton to examination under the microscope, that cleaned by Macdonald’s appears somewhat irregular in fibre, whilst the other is uninjured. Mr. W. Eames, the Secretary of the New Fort Gloster Mills Company, has also obligingly handed your Committee the following report on the samples:—

“ ‘I have examined the two samples of cotton sent on Saturday. That marked Dunlop’s is more regular in staple than that marked Macdonald’s, which is a little weaker.

"I consider the cotton treated by the Dunlop's machine to be well cleaned, and with little injury to the fibre."

S. DOUGLAS,

C. A. CANTON.

The Council, in submitting this Report to the Meeting, are of opinion that Mr. Macdonald is entitled to favorable consideration for his praiseworthy attempts towards the improvement of Dunlop's machine; and they hope that the adoption of the suggestions contained in the report may lead to still further improvements.

Resolved, that a copy of the above Report and Resolution of the Council be communicated to Mr. Macdonald.

Read a letter from the Secretary Government of India, submitting a report by Dr. Brandis on experimental Cotton cultivation in Pegu during 1860-61, and forwarding certain bales of Cotton in illustration thereof.

Read the Report of the Committee on the above samples.

Resolved, that a copy of this Report be furnished to the Government of India, and that it, and Dr. Brandis's Report, be published in the Journal.

In connection with the subject, the Secretary read the following letter to his address from Mr. P. Saunders, Commissioner to report upon the cultivation of Cotton, dated from Roorkee, the 5th September:—

"Since I last addressed you on the 12th August, I have visited a small Cotton plantation belonging to Mr. F. C. Bryant, of Futehgurh.

"The seed that Mr. Bryant had sown was portion of the same parcel supplied by you to the gentleman at Mynpoorie, which, having been steeped in hot water, did not germinate, and soil and climate were duly reported as being unsuited for that kind of seed.

"The seed sown by Mr. Bryant had all germinated; but the plants, when I saw them, were sickly, yellow, and stunted, and Mr. Bryant had also come to the conclusion that soil and climate were not suited to the growth of foreign seed.

"The seed had been sown with the first rains in June (about the 20th), and up to the time I saw the plantation (5th of August) no hoe or plough had ever touched the soil. The consequence was that the earth had been beaten down by the rain, and hardened and baked by the sun. The plants were absolutely strangled by the hardness of the earth around them, and maintained a feeble and sickly existence. Mr. Bryant admitted that he did not know that the earth ought to be turned up either by hoe or plough.

He, however, ordered the ground to be hoed at once, and promised to report to me the result, but as yet I have not heard from him.

"I think it proper to report such cases to you, that you may be prepared for similar statements of unfitness of soil and climate.

"I have just received your letter of 27th August. No seed for distribution will be required for the next six months in these Provinces."

Communications on various subjects.

The following letters were also submitted :—

1.—From R. W. Bingham, Esq., of Chynepore, enclosing sketch of a steam engine by Messrs. Aitken and Co., Civil Engineers, Glasgow, for the purposes of irrigation; also copies of his correspondence with them, and adding some further remarks on the subject.

2.—From Capt. Ivie Campbell, Deputy Commissioner, West Berar, respecting the Chikuldah Hills as a good locality for trial of plants and seeds of various kinds. "I have to thank you," writes Capt. Campbell, "for the very acceptable present of South African seeds collected by Captain Lowther. Some of them I shall try here; others, such as *Pinus*, *Cupressus*, &c., are more likely to thrive on the Chikuldah Hills in this neighbourhood. I shall be glad to get a few seeds of Vanilla, of the everlasting Pea, or any other seeds which may be still available. I can here make experiments in two very different climates. That of Ellichpoor, being in the valley of Berar, is of course very hot, the place being only 1,300 feet above the sea; on the other hand, the Chikuldah Hills, near the Hill Fort of Gavilghur, and about 18 miles from this, are from 3,700 to 4,000 feet above the sea; the fall of rain last season, the only year in which observations have ever been made, was 66½ inches; it will be probably much more this year, which is an unusually wet one: the thermometer is always 10° or 12° lower than at Ellichpore; any seeds suited for either of these localities, presented by Members to the Society, and which may be available for distribution, I shall be at all times glad to receive.

"The Guinea-grass seed, which you were kind enough to send, germinated freely, and by dividing the roots, I shall be able to distribute a number of plants on the hills. I have English clover growing there, but it is only lately sown; it, however, promises well.

"I am sorry to say the whole of the Tea seed, China and Assam, failed. But early in February, I received from a kind friend near Assam, a quantity of Tea seed from that district. Being in the country, I could sow no portion of it till the beginning of April; of what I then put down in the hot climate of Ellichpoor, between 60 and 70 per cent. had sprouted before the end

of June. Not having ground ready on the Chikuldah Hills, I was unable to sow any of the seed there till the 28th of May. Many of these were destroyed by the carelessness, in weeding, of the maloes, who had never seen the tea plant, but 10 or 12 per cent. of the plants have been saved, and they, as well as those at Ellichpoor, are strong, healthy ones, with from eight to twelve leaves. Those at the latter place I shall of course be obliged to remove to the hills before the hot weather. Looking to the report on tea cultivation in the North-West and Punjab, I was surprised to find so many of the seeds germinate, when sown at the season they were, and after having been kept so long. The success is probably due to the seeds having been sent to me packed in very finely powdered charcoal; all my former experiments with the seed had failed even when it was packed in fine sand or earth. By next rains, I hope to be able to give you a further account of my experiment with tea, as well as of the climate, capabilities, and vegetable products of the Chikuldah Hills. The peach grows there very well: a number of trees, which had been neglected for years, neither pruned nor watered in the hot weather, and in two seasons, nearly destroyed by the grass and brushwood which had sprung up about them having been fired, were this season loaded with fruits of very fine flavour. I have given you a poor account of the place, but you may be able to judge what plants might be introduced with a prospect of success. Cotton, which is the chief crop of the valley of Berar, is not grown in the hills, and would not, I think, succeed. I, this season, tried both the New Orleans and the brown Nankin cotton, of which I sent you specimens last year, but the heavy rains and constant fogs at this season have rotted almost the whole of the plants. They might perhaps succeed if on ridges, but this mode of cultivation would be expensive. Should any plants of the New Orleans get through the rains and produce anything, I will send you a sample."

In a subsequent letter Capt. Campbell remarks—"I see that Capt. Lowther, in writing from the Cape, remarks that no botanist he has ever met, seems ever to have heard of a white flowered *Erythrina*, and from his account it appears the tree is a rare one, at least in the Bengal side. I do not observe any mention of the white flowered variety in any regular Botanical work, but Dr. Riddell, in his "Manual of Gardening for Western India," notices it. It is in this part of the country called the *Sufed Pangra*, and though not nearly so common as the scarlet variety, yet a few trees are found near every large town. The bark is used by the natives in scrofulous and other diseases. The tree does not flower till the cold weather. As soon as the pods are ripe, I will, should you wish it, send you some of them."

3.—From Capt. J. C. Haughton, Port Blair, on the subject of mangrove bark, gum resin, &c. :—

"I have prepared for shipment to the Secretary Chamber of Commerce, Calcutta, six casks and six bundles of mangrove bark, in conformity with the offer conveyed in your letter of 16th May last. They will go by the first opportunity. I would suggest that, if possible, an opinion be obtained as to the quality not only as a dye but for tanning purposes. I have also prepared two cases of the sawdust and wood of the Andamanese Red-wood tree—*Pterocarpus Andimanensis*—which I would suggest may accompany the bark for test as utility as a dye. It would be desirable also to know their market value or probable market value, if imported into England.

"With reference to Mr. Lazarus' report on the Gum sent up, I beg to say that if I called it Copal, I did so merely from want of a better name. The Dammer of the Archipelago is not, according to Crawford, true Copal, nor is the Gum of the *Fateria*, according to Drury, Copal; but that which I sent resembles it in the way in which it is found, *viz.*, in the ground. It is believed either to exude from the roots or to drop from wounded branches. I have not seen the tree which produces it, though I have seen a tree producing a very fine clear Gum Resin, of which, however, I regret I was unable to get enough to send a specimen.

"The Burmese who collected the Gum at the Great Coco differed as to its identity. It was called ————Nga Bay, translated by Mason, *Odina Wodier*;

also

Chay translated by the same { *Syndesmis Tavoyana*
&
Semecarpus Anacardium.

• also

Ponginet, for which I can find no equivalent. The *Shorea robusta* or Sal does not, in my belief, grow either here or in the Tenasserim Provinces. I know the tree well, having lived for about nine years in a part of India where it is remarkably abundant. I am much obliged to Mr. Lazarus for the information he has given as to the properties of the Gum. It may be interesting to him to know that it dissolves quickly in turpentine, and makes a very tolerable furniture varnish, drying rapidly."

4.—From A. G. Murray, Esq., of the East India Railway, Agra, proposing that an exhibition of agricultural produce and implements, &c., be held at Allahabad, in January or February next, and offering certain suggestions thereon.

It was agreed that the suggestion is a good one, but that the time had not yet arrived to carry it properly into effect.

5.—From C. Brownlow, Esq., Cachar, submitting hints for the cultivation of Tea by the nursery method. (Transferred for publication in the Journal.)

6.—From H. Cope, Esq., forwarding a lithographed copy of the proceedings of a Meeting of merchants connected with the Shawl trade, held at Umritsur, on the 24th August, "to take into consideration the present depressed state of the Shawl trade of the Punjab, its causes, and the means to be adopted to counteract the undoubted and rapid downward tendency of that trade."

For the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 13th of November, 1861.)

W. G. Rose, Esq., Vice President, in the Chair.

The Proceedings of the last General Meeting were read and confirmed.

The following gentlemen, proposed at the last Meeting, were duly elected members:—

Messrs. W. Macpherson, C. S., Archibald Campbell, Maharajah Luchmessur Sing Bahadoor, Captain W. Neembhard, Messrs. James Parker and John Power, C. S., and Captain H. T. Pollock.

The names of the following gentlemen were submitted as candidates for election:—

R. N. Shore, Esq., C. S., Cuttack,—proposed by Mr. Grote, seconded by Mr. Cantor.

Captain A. Blunt, Commanding 8th Bengal Police Battalion,—proposed by Mr. Grote, seconded by Mr. Cantor.

George Aubrey, Esq., Civil Engineer, Cuttack,—proposed by Mr. Grote, seconded by Mr. Cantor.

Andrew Anderson, Esq., Sub-Deputy Opium Agent, Futtehpore,—proposed by Mr. C. F. Wintle, seconded by the Secretary.

Captain W. T. Salmon, Secretary I. G. S. N. Co.,—proposed by Mr. J. N. T. Wood, seconded by Mr. S. P. Griffiths.

Captain J. S. Tulloh, 25th Brigade H. A., Jullundur,—proposed by Col. F. C. Burnett, seconded by the Secretary.

G. O. Beeby, Esq., Solicitor, Calcutta,—proposed by the Secretary, seconded by Mr. Cantor.

Captain J. F. Sherer, Deputy Superintendent of Cachar,—proposed by Mr. C. B. Stewart, seconded by Mr. S. P. Griffiths.

Charles B. Le Mesurier, Esq., Resident Engineer, E. I. R., Chunar,—
proposed by Captain George Weld, seconded by the Secretary.

The following presentations were announced :—

1.—Mueller's *Fragmenta Phytographiæ Australiæ*. Vol. I. Presented by the Author.

2.—Annual Report of the Government Botanist and Director of the Botanic and Zoologic Garden at Melbourne. Presented by the Author.

3.—Papers regarding Culturable Waste Lands at the disposal of Government. Presented by the Government of Bengal.

4.—Selections from the Records of the Government of India, Foreign Department, No. 34. Presented by the Government of India.

5.—Three ploughs, a hand-plough, and a hand cultivator, an Excelsior corn sheller, a hand grain mill, and two butter churns. Presented by Messrs. D. Landreth and Son, of Philadelphia.

6.—A collection of Orchids from Port Blair. Presented by Captain J. C. Haughton.

7.—Sundry samples of Cotton raised at Akyab, by Messrs. Langlois and Halliday. Presented by Major F. W. Ripley.

8.—Sample of Cotton raised at Seetapore, Oude, from New Orleans Seed. Presented by Mr. P. Saunders. (Referred to the Cotton Committee)

9.—Sample of tapioca, prepared by Mr. J. F. Langlois from the *Jatropha Manihot* of the Arracan jungles. Presented by Major F. W. Ripley.

A report on the germination of the English flower seeds from Messrs. Carter & Co., was submitted by the Gardener, from which it would appear that 23 kinds had germinated fairly, 25 partially, and 23 have failed.

On the recommendation of the Council, Mr. W. Haworth's name was added to the Cotton Committee.

Letters were read :—

1.—From Under-Secretary Government of India, submitting further communication from the Resident at Hyderabad, respecting the cultivation of cotton in that territory.

2.—From the same, forwarding letter from the Resident at Hyderabad, reporting the failure both in East and West Berar, of the experimental cultivation of cotton from the New Orleans seed received last year from the Bengal Chamber of Commerce. (Transferred to the Committee of Papers.)

3.—From Mr. G. Macdonald, respecting the report on his Cotton Gin, and requesting further trial. (Referred to the Cotton Committee.)

4.—From H. Cope, Esq., some more notes on the introduction of the silk-worm into the Punjab. (Transferred for publication in the Journal.)

5.—From the Adelaide Philosophical Society applying for eggs of the castor oil plant feeding silk-worm (*Attacus ricini*), and for full information respecting its management, &c. (To be complied with.)

6.—From Captain C. M. White, Assistant Resident, Travancore, applying for a small quantity of Assam and China tea seed. "I am under the impression," observes Captain White, "that the climate of the elevated parts of Travancore are favorable to the tea plant, as even in my own compound, only 100 feet above the sea, there is a tea tree some 20 feet high, which has thriven without care, lived through last year's drought without being watered, and is now flowering profusely. Its age or from whence it came I do not know." (Application complied with.)

7.—From R. W. King, Esq., Chittagong, submitting a report from Mr. R. Twining, of London, on a sample of tea grown and manufactured at Chittagong. "The garden from which the sample was taken," writes Mr. King, "was, I believe, formerly planted by Mr. Sconce, of the Civil Service. I have no doubt but that the hills to the N. E. of this would grow tea as well as any land in India, and they possess the very great advantages of good water communication with the port. The crop might in a few hours after leaving the gardens be alongside the ship."

The following is copy of the report alluded to, from Mr. Twining:—

"We tested your sample of Tea and found it A. 1. Such a tea, if properly picked and brought over here as an article of merchandise, will command a high price, and especially if it were rather better manipulated and not quite so high dried. The flavor, however, is excellent, and the infusion very bright and clear."

8.—From Captain John Stewart, Commissary of Ordnance, Cawnpore, applying for information respecting tanning-yielding plants. (Complied with.)

9.—From F. C. Brown, Esq., Tellicherry, requesting information regarding Peill's patent water-raising Engine. (Complied with.)

10.—From Lionel Berkley, Esq., Kotghur, near Simla, of which the following is an extract—"I am very anxious to obtain some seed of the Cinchona plant, as I am sure it will do well here. We can sow it in different elevations, and in soil of different kinds, so as to give it a fair trial. This is a wonderful place for English fruit. The English apples, pears, apricots, cherries, currants, gooseberries, &c, thrive here. We have also the hop-plant growing wild, raised from some seed sent from England; at a lower elevation, the Indian fruits grow to great perfection."

11.—From Dr. A. Burn, Sholapore, some remarks on the subject of "How to avoid against Famines." (Referred to Committee of Papers.)

12.—From Captain Thomas Hutton, Mussourie, returning thanks for his election as a Corresponding Member, and requesting that, as by the rules such members are only entitled to such numbers of the Journal as may contain their contributions, he may be considered a regular subscriber thereto.

Resolved, on the recommendation of the Council, that an exception to this Rule be made in favour of Captain Hutton, in consideration of the interesting and valuable information he has, from time to time, communicated to the Society.

13.—From Major F. W. Ripley, enclosing a paper by Mr. J. F. Langlois on the culture and preparation of Tapioca. (Transferred for publication in the Journal.)

For the above presentations and communications the best thanks of the Society were accorded.

(Wednesday, the 11th of December, 1861.)

A. Grote, Esq., President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected members :—

Messrs. R. N. Shore, C. S., Geo. Aubrey, C. E., Capt. A. Blunt, Capt. W. T. Salmon, Capt. J. S. Tulloh, Capt. J. F. Sherer, Messrs. Andrew Anderson, G. O. Beeby, and C. B. Le Mesurier.

The names of the following gentlemen were submitted as candidates for election :—

Fred. Eden Elliot, Esq., B. C. S.,—proposed by Mr. W. H. Lowe, seconded by the Secretary.

F. A. Tilton, Esq., Merchant, Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

Lieut. F. H. Lewin, Police Corps, Rampore Bauleah,—proposed by Mr. A. Grote, seconded by Mr. C. A. Cantor.

John Parratt, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. Creswell.

H. G. Temple, Esq., Solicitor, Calcutta,—proposed by Mr. W. G. Rose, seconded by Mr. C. B. Wood.

The following presentations were announced :—

1.—Cleghorn's Forests and Gardens of South India. From the Author,

2.—Selections from the Records of the Government of Bengal, No. 38. From the Government of Bengal.

3.—Annual Report of the Agricultural and Horticultural Society of Western India. From the Society.

4. Journal of the Asiatic Society of Bengal, No. 3 of 1861. From the Society.

5.—Sundry reports for 1860-61, on the Administration of the Bengal Presidency, of the Punjab and its Dependencies, Mysore, the Coorg District, Port Blair; also, reports in the Public Works Department, Financial Department, Post Office, Geological Survey, and Legislation. From the Government of Bengal.

6.—A small quantity of seed of the Carob tree, (*Ceratonia siliqua*.) From Dr. E. Bonavia.

The following is an extract of Dr. Bonavia's note on the subject:—

"I have this-day despatched to your address a small parcel containing seeds of the "Carob tree" from Malta and also from Cyprus, the latter a very good kind, eaten by men and animals; the former is more meagre and delights in scanty soils such as fissures in rocks, &c., it is equally eaten by men and cattle. I have tried some and they are germinating well. I first steeped them for two or three days in water, putting the vessel containing them in the sun. When they were softened, I planted them in pots, and plunged them in a hot bed. They should be protected from birds while they are germinating. They may not, perhaps, suit the climate of Bengal, as the Mediterranean is their natural country. In that case you can give them to some body out of Bengal. If they do well, I shall import a large quantity of the seed next year."

The Secretary mentioned that there were some plants of this useful tree in the Society's Garden, about 16 years old, and 14 to 16 feet in height, which had not flowered up to the present time. An arid soil and dry climate are more suitable for them.

7.—A small assortment of seeds from Southern Africa. Presented by Capt. W. H. Lowther.

The Secretary read an interesting communication from Capt. Lowther, from Cape Town, dated 27th May, of which the following are extracts, relating to the above collection of seeds:—

"As there is a ship going in your direction, I make you up a small packet of such odds and ends as I think will be acceptable.

"1st.—A sample of fine Coffee lately given to me by the Chevalier Du Prat, Portuguese Arbitrator on the Commission in this Port: he des-

cribes it thus—'this Coffee is supposed to be the finest in cultivation, was sent to me from St. Paul de Loanda, by the Governor-General of A. la, where it is considerably grown.' I opened the chest myself, and found about 80 or 40 lbs. weight; it was improperly packed, and *had heated* during the voyage; I have, therefore, taken no pains in re-packing, as I think not one would germinate. I have instructed the Chevalier as to the proper mode of preservation, *viz.* that as soon as the berries are *dead ripe*, they should be opened out on a mat in a shady place; when thoroughly free from juice, carefully packed in layers alternately, with good dry earth, in a cask or case, secured in *canvas* or *matting*—(as a sure caution against bursting.) He has promised to obtain a quantity so treated, and you can, therefore, apply for a portion, in the name of the Society, to the Superintendent, Botanical Garden, Dr. Puppe, or his subordinate Mr. McGibbon.

"2ndly.—I send you a small quantity of Medlar seeds: I have been feasting lately on this, to me, delicious fruit, which now seems thoroughly naturalized in the Colony. The low hills in the North-West, and indeed any climate free from hot winds, will suit the tree well enough. At the Botanical Gardens, fine seedlings and grafts are obtainable.

"3rdly.—I forward a few well-matured pods of a fine "*Swainsonia*" brought from Australia by Sir G. Grey, and which comes to great perfection in the Botanical Gardens. This is an elegant shrub, with pinnate leaves and finer papilionaceous flowers.

"4thly.—Some more seeds of the "*Stone Pine*" (*Pinus Pinea*) the tree which constitutes the woodlands of and about Cape Town. You might get *tons* of seeds, and it is so numerous here, that an estimate has been made of Mr. Van Breda's plantation on Table Mountain being worth *thirty thousand pounds*, at only *one shilling* a stick, and I believe we have it in Central India, but it came here from the Mediterranean. The kernels are much eaten, but are very unwholesome, owing to the turpentine they contain, the cones seem very full of native pitch, and are sold in the markets as fuel. This Pine delights in bare, bleak, exposed hills, where little else thrives, and might, therefore, suit the *Kohistan of the Punjab*, where timber and fuel are great *desiderata*. It is highly inflammable as you may suppose. We had a magnificent conflagration lasting more than 24 hours on Table Mountain, the cause undiscovered, but some hundred pounds worth of fire-wood were burnt. From the sea the spectacle is said to have been superb; there were crescents, squares, and all sorts of monster *feux d'Artifices*, as the high wind carried the furious element along the regularly laid out masses of old pine trees."

he Secretary mentioned that the Coffee seed, as supposed, had reached in unserviceable condition.

" 3.—A small collection of seeds and a sample of fibre from China. Presented by R. Fortune, Esq.

" I have great pleasure in sending you," writes Mr. Fortune, in a letter dated from Peking, 30th September, " for the Agricultural and Horticultural Society of India, the following seeds, &c., which I have collected in the districts near the Capital of China, viz. :—

" 1st.—Two kinds of Millet (red and white), remarkable for their great size. They grow in the Province of Shantung and also in the great plain of Tein-tsin, and attain a height of from 12 to 15 feet. I also send you samples of the heads of this Millet.

" 2nd.—One packet of the seed of the Jute of Tein-tsin and Peking, and a sample of the stem and fibre. You will observe that it grows to a great height, and will be able to compare it with that now produced in India. It is chiefly used in the manufacture of ropes and cables, and appears to be of a good quality. Its seeds are used to feed horses, and the stem, after the fibre has been removed, is sold in large quantities in this part of China and used for fuel. The long stems of the Millet are also used as fuel, and both Jute and Millet stems are most useful in a country like this, where there are few trees or firewood of any other description. I shall be glad to have your opinion upon the Jute, and whether you consider it different, or superior, or inferior, to that cultivated in Bengal.

" 3rd.—One packet of the Bringal or egg plant of Peking. This is also remarkable for the great size of the fruit. A specimen in my possession, and which I hoped at one time to send you, (I am afraid it is rotting,) measures 18 inches in circumference. This vegetable is largely grown, and much esteemed all over the Provinces of Shantung and Pechele.

" 4th.—One packet of the seeds of *Sesamum orientale*. This also is a large and prolific variety, growing about twice the height it attains in other parts of China, where I have met with it.

" 5th.—One packet of the seed of Knole-kole. This is also a common vegetable near Peking ; is sometimes met with of a great size.

" It is a curious fact that both the animals and vegetables of these Provinces are remarkable for size. I remember some years ago seeing the Shantung merchants in Shanghai for the first time. They seemed to attract the attention of their own countrymen in Shanghai even more than foreigners on account of their size, they being in general several inches taller than the

natives of the provinces further South. This autumn I have had an opportunity of seeing them at home, and they, certainly, are a fine, strong race of people. The bullocks, horses, and mules are also much larger than those of the Southern provinces, although not larger than we have in Europe; and lastly, the vegetable productions, of which I send you seeds and samples, are most remarkable for the same quality.

"I shall be glad to hear that you receive the parcel I have packed for the Society, and shall look forward with interest to your reports upon the different products. I only wish it had been in my power to have done more for the Society during my last visit to this country and Japan, but the difficulties of direct communication and want of time prevented me."

The fibre in question is harsher and weaker than the best description of Bengal jute; while the stem or stalk is twice the thickness.

9.—A sample of cotton and of thread made therefrom. Presented by Lieut. J. M. Heywood, Bengal Engineers.

Mr. Heywood states that he picked off this cotton from plants growing in the Terai below Kursiong. "I do not know whether they are good samples of cotton, if they are, the ground on which they grow, being close to where the new cartroad will run, and being for the most part uncleared, will become very valuable. As settlers can live in the hills above, I should fancy the deadly malaria of the Terai will not affect them when riding about looking after their plantations. If it does, of course the cotton must be allowed to grow as it does now."

This cotton has been evidently raised from indigenous seed; it is short in staple, and closely adhesive to the seed; but the pods are of fair size.

10.—Samples of cotton raised at Punkabarree, from Egyptian and New Orleans seed received from the Society. Presented by L. Pereira, Esq.

The pods from the New Orleans seed are large, and the quality of the cotton fair; that raised from the Egyptian seed, is also encouraging.

11.—A box containing specimens of moths and cocoons of various silk yielders, as a guide or reference. Presented by Capt. Thomas Hutton.

The moths have unfortunately been much hurt in transit; the cocoons have reached undamaged.

12.—A small sample of the raw silk of *Attacus Atlas* from Mussourie. Presented by Capt. Hutton.

The following is Capt. Hutton's letter on the subject:

"I write merely to enclose a small sample of the silk of *Attacus Atlas*, which, with others, I am endeavouring to unwind. As yet my experiment is promising, but whether I shall fully succeed in unwinding a cocoon remains

to be seen. The treatment in this case has been after boiling the cocoons in a particular mixture, to remove the outer coating of the cocoon altogether, and then winding off by a single fibre;—the thread runs merrily for a good length, but then suddenly snaps, and it is sometimes necessary to remove another layer of silk before reeling can again be resorted to. This may perhaps be eventually overcome by further practice and experiment, for it is a great step gained to get the silk to yield at all. The cocoons appear to be differently constructed from those of the Mulberry silk-worms, and the silk is disposed in bags one within the other; the outer one is very coarse, and must be removed before winding can be resorted to, and even then the thread seems to break at the termination of each lar, *i. e.* when the bag is exhausted, and then another thread has to be found. This, as I said before, may perhaps be overcome, and if so, I think the silk may become valuable. Of this, however, you can obtain fuller information among the gentlemen around you, who are interested in silk. The fibre appears to me to be strong, even, elastic, and glossy, and the colour for certain manufacture good. I await your opinion. If this cocoon can be rendered useful, I may possibly succeed with the *Eria* also, as both belong to the same genus. The solvent used is an idea of my own, and if it is successful, will not, I think, be too expensive.

“I have tried the same with the Tu-sur, but the solvent appears to act too powerfully, the silk coming away in masses instead of in a single thread; this may perhaps be obviated by diluting and weakening the solvent.

“The sample sent is somewhat dirty, and ought to be more glossy, but it is good enough to show you the kind and quality of the fibre.”

The following is Mr. L. G. Buskin's opinion on the above silk:—

“This little sample appears to be reeled from very good cocoons, the thread is very elastic and bright; it is, however, too brittle for use in its present state, and should be reeled eight or ten cocoons to each thread, and plenty of twist given. It should then be made up into skeins of the same length as “Bengal silk,” and there is no reason why it should not then be marketable and fetch a good price here.”

A Report was submitted from the Cotton Committee on certain samples of cotton laid before the last Meeting, the produce of Akyab, and Seetapore, &c. The report on the samples raised from foreign seed (New Orleans and Egyptian) is very favorable. The Secretary intimated that a copy had been sent to Major Ripley and Mr. Saunders, for their information.

The President submitted a photograph of Mr. McIvor's *Cinchona* plants in their green house at Ootacamund, and his report on their condition on the 9th November. From this it would appear that there are seven varieties under cultivation, in all 5315 plants, consisting of *Cinchona Succirubra*, or red bark; *C. Calisaya*, or Calisaya bark; *C. nitida*, genuine grey bark; *C. micrantha*; *C. Peruviana*; and *C. lucunafolia*, a species from Java, of no value; and another species without name.

Mr. McIvor reports as follows, on the condition of the above plants:—

"The imported plants are all in very fine condition, many of them being in the most luxuriant state of health. The largest of the plants measure from 3 feet to 3 feet 6 inches high, and some of their leaves measure 10 by 15 inches. The average growth of the month being about $2\frac{1}{2}$ inches. The maximum growth made by the most luxuriant shoots being 11 inches. The first of our seedlings are from 9 to 12 inches high and from 10 to 15 inches in diameter across the leaves. The average growth of the month being about $1\frac{1}{2}$ inches, while the maximum monthly growth made by the most vigorous plants is $3\frac{1}{4}$ inches."

A communication was read from Captain J. C. Haughton, Superintendent of Port Blair, on the result of sowings of certain seeds furnished to him by the Society. "A good deal of the seed sent," observes Captain Haughton, "was of kinds not suited to tropical climates, or rather only suited to temperate ones, thus wheat, barley, the grasses, &c., either did not vegetate, or if they did it was only to struggle into life and through it fruitless. On the other hand the Settlement is indebted to the Society for many valuable seeds, the best account of which is the out-turn of produce given into Government for the year 1860, a copy of which I annex for your information. This does not include a very large quantity of European garden seeds distributed to private parties, of which I have no account. The climate is rather too damp for European vegetables, on which we have not an adequate return for seed sown."

The statement enclosed in the above shows that during the year 1860, the sum of Rs. 1,893 was received by the sale of vegetable products of some 30 kinds, the principal being plaintains, sugar-cane, yams, millet, torace, and brinjal.

Read a letter from Captain Hutton in reference to the resolution passed at the last meeting. Captain Hutton says:—"I trust you will do me the favor

to express to the Society my best thanks and appreciation of the very flattering compliment they paid to me, and that I hope to present to the Society a paper on the genus *Attacus*, which I trust will sustain the very kind interest hitherto taken in my communications by its members, and prove of service to those who are engaged in the culture of the silk-worm."

A communication was submitted from Baboo Probadchunder Mundle, Secretary of the Branch Society at Balasore, enclosing copy of the proceedings of a recent meeting, at which, among other resolutions, one was passed to the effect that the Secretary be requested to ascertain the feeling of the native members in respect to the dissolution or continuance of the Society.

For the above communications and presentations the best thanks of the Society were accorded.

R E P O R T

Agricultural and Horticultural Society

O F I N D I A.

*Report from the Council to the Annual General Meeting of the
15th January, 1862.*

In presenting their usual Annual Report to the Members, at their present Anniversary Meeting, the Council have the pleasure of announcing that the affairs of the Agricultural and Horticultural Society of India continue to progress satisfactorily.

The number of Members elected during the past twelve months, though not equal to the three preceding years, may be considered a fair average,—viz: 97. Of these 22 are Civilians, 17 Merchants, 15 Agriculturists, 26 Military officers, 9 of the Medical profession, 8 Native members of the community, and 2 of the legal profession.

The following is the classification list of Members:—

Report of the Agricultural

CLASSIFICATION	In 25 previous years.	In																	Gross Total.	Total real number at close of 1861, after deducting lapses
		1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.			
Honorary Members, ...	11	1	0	1	0	0	0	1	0	1	0	2	0	0	1	0	0	15	10	
Associate Members, ...	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	4	3	
Corresponding Members, ...	232	13	15	22	8	10	22	16	18	6	23	23	17	19	25	25	22	522	291	
Civilians, ...	201	14	12	13	10	14	20	12	5	16	15	31	11	20	15	18	17	447	144	
Merchants and Traders, ...																				
Indigo and other Tropical Agriculturists, ...	190	15	6	5	1	9	19	13	10	7	14	12	10	14	21	15	15	375	127	
Military Officers, ...	160	10	11	11	11	9	34	15	22	19	26	22	12	14	27	35	26	470	174	
Medical Officers, ...	80	0	2	3	5	7	4	5	3	4	6	9	3	3	16	11	6	167	53	
Asiatics, ...	63	2	14	5	6	9	8	8	8	5	5	7	14	19	4	6	8	191	68	
Clergy, ...	14	1	1	0	0	2	1	1	1	1	2	1	2	0	0	1	0	27	6	
Law Officers, ...	40	1	0	0	6	4	6	3	1	3	6	2	1	5	2	1	2	53	21	
Miscellaneous, ...	9	0	2	0	2	2	6	0	0	10	0	0	0	2	7	5	0	50	33	
	1,002	58	62	60	49	67	122	78	69	72	100	109	72	102	118	123	97	2,360	44	

The lapses alluded to in the last column comprise 19 deaths, 48 resignations, 2 whose names have been removed from the list in consequence of their subscriptions being deemed irrecoverable, and 14 whose names have been withdrawn in accordance with section 6 chapter iii of the Bye laws, their absence from India having extended beyond four years ;—amounting in all to 83.

Of the total number (844) introduced in the last column, 33 have compounded for their subscriptions ; 125 are absent from India, and 17 are Honorary, Associate and Corresponding ; in all 175 :—leaving 669 as the actual number of paying Members at the close of the year.

Among the Members lost to the Society by death during the past twelve months, the Council regret having to record the name of Dr. Charles Huffnagle (American Consul) and for many years an Honorary Member, to which office he was elected in the year 1836 for valuable services rendered in obtaining consignments of cotton seed from North America. Dr. Huffnagle continued to take an active interest in the affairs of the Society from that period till his departure from India in 1859.

Another old Member and promoter of the objects of the Society, Coll. S. F. Hannay, has likewise been removed by death from amongst us. Coll. Hannay evinced much interest in various departments of agriculture, but more especially in fibre-yielding plants and cotton, respecting which several of his papers have been published in the Journal.

The other Members deceased during the year are Mr. Samuel Smith, one of the oldest subscribers, always a warm friend of the Society, and in former years a zealous co-operator in its objects ; Mr. T. A. Wise ; Rajah Ramchand Sing ; Mr. E. A. Samuells, c. s ; Baboo Issurchunder Sing ; Mr. Justin Finch, an occasional contributor ; Coll. Geo. Congreve ; Mr. W. Dampier ; Coll. W. Swatman ; M. H. Inglis ; Sir R. de L. St. George ; M. J. L. Turnbull ; Coll. P. Abbott ; Mr. R. Watson ; Mr. M. Tweedie, Mr. S. J. Sarkies and the Rev. Dr. Boaz.

Pursuing the subject of the internal economy of the Society the question that next comes under consideration is that of finance. The usual statements of receipts and disbursements, vested fund-

liabilities and arrears of subscription are herewith submitted. It will be seen that the total income during the year has been Rs. 35,496 : 0. 4, including the cash balance at the close of 1860, and the expenditure Rs. 34, 978. 0. 1, leaving a balance in the Bank of Bengal and in the hands of the Secretary of Rs. 518. 0. 3. The liabilities amount to Rs. 13, 975—and the dependencies to Rs. 11,862. 7-9, exclusive of the Vested Fund amounting to Rs. 20,333 : 5, 4. The arrears of subscription still continue heavy ; but now that the Society has been registered under Act XXI of 1861, which will enable it to sue as well as be sued, the Council hope to be able to reduce this comparatively large amount during the ensuing year.

The Society has continued its active measures for the encouragement of horticulture by holding public shows of vegetables, fruits and flowers. Tents not being at the time available, these exhibitions were of necessity held in the Town Hall, a building ill adapted for such purposes. The shows took place in Jan, Feb. and April. The vegetable department was well represented, and the collection of flowers was, altogether, better than that of 1860. The total sum awarded was Rs. 1042, of which Rs. 706 were given for vegetables and fruits, and Rs. 336 for flowers.

The usual full supplies of seeds have been imported during the past year for distribution to members. The consignment of American vegetable seeds has given satisfaction, with the exception of peas and beans, of which several complaints have reached the Society. As these seeds appeared to be fresh and good on opening the cases, and as the sowings in the Society's garden have resulted favorably, it would, perhaps, be unjust to Messrs D. Landreth & Co. to say that they formed portion of an old stock. It may be, as the past rainy season proved unusually damp, that they partially suffered from the necessary exposure from opening the boxes on arrival, and perhaps in transit to the various, and in many instances, distant localities to which they were despatched : or perhaps from too great moisture in the soil at the time of sowing. The latter was the case with a small portion of the peas put down in the Society's garden : a second sowing was necessary, and these germi-

nated well. The Cape vegetable seeds have not proved equal to the American; but there would appear to be a general deterioration in later consignments from that quarter. The flower seeds from England, though on the whole better than those of last year, have not, altogether, germinated well. The season has, however, been equally as unfavorable for the flower as for the kitchen garden; and large quantities of seed have been destroyed consequent on a continuance of the rainy season at least a month beyond the usual period. A quantity of seeds of field crops have also been received and widely disseminated not only to Members but to the public generally. It is satisfactory to add that the Managing Directors of the P. and O. Company have acceded to the Society's request to be allowed to receive by overland conveyance annual supplies of vegetable seeds to the extent of two tons measurement, at half the Company's usual rate of freight. This concession may enable the Society to obtain, in future, consignments of vegetable, in addition to the flower seeds annually imported from England for distribution to Members.

The Society is indebted to several correspondents for contributions of seeds and plants. The Council would desire, more especially, to allude to the continued zealous exertions of the Society's valued member, Captain W. H. Lowther, who has forwarded several collections of seeds, useful and ornamental, with much interesting information regarding them, from Mauritius, Bourbon, and the Cape of Good Hope. The Council had hoped to receive valuable contributions from Japan and China through the agency of Mr. R. Fortune; but in a communication received at the close of the year, on the eve of his return to England, he expresses his regret that want of time, and the difficulties of direct communication, have prevented his carrying the wishes of the Society into effect.

In connection with the agricultural and horticultural department the Council desire to offer a few remarks regarding the Nursery Garden. It is satisfactory to record that the quantity of useful and ornamental plants, and fruit grafts distributed during the past year equals that of 1860, and exceeds the distribution of former years. About 14,000 plants have been issued, of which nearly 5,000

are fruit grafts, in addition to sugar cane and miscellaneous products, and a quantity of seeds, of which monthly gatherings are made. At least 50 packets of such seeds have been given to members for transmission to Europe. The number of applicants for plants have been 162. Besides these, 61 glazed cases have been issued to Europe, China, the Eastern Islands, and the various Provinces of British India. Among the works attended to, it may be observed that a considerable number of young fruit trees of various descriptions have been planted out on newly selected spots: these are intended solely for propagating purposes. In a garden like this a necessity must always exist for keeping up and extending its resources for such purposes, more especially in the orchard department. The main or principal roads have received a new layer of material to the extent of 17,124 superficial feet; and the same operation is being carried on in respect to the minor walks throughout the garden. A few requisite alterations have been put in hand during the year, some of which have been completed, and others are still in progress, which may be briefly enumerated,—viz:— the extension of the rosary in the formation of additional beds on the spot of lawn directly to the South of the Banian tree; this step has been found necessary to meet partially—for it cannot be fully met—the annually increasing demand for this favourite class of plants. The present rosary, to the East of the conservatory, has also assumed a more pleasing aspect, by the introduction of strips of grass lawns, extending from East to West throughout the entire plots. Another work, which has caused no inconsiderable amount of labor, has been nearly brought to completion, namely that of raising to one uniform level that portion of the garden formerly occupied with cotton plants on the West side of the conservatory. In this spot of ground it is proposed, at the proper season of the year, to put down the choicest flowering shrubs, in order to increase the present inadequate means of propagation with reference to increasing demands in this line. This will make that portion of the garden uniform, and extend the ornamental department to the East side of the new main road. It is also in contemplation to carry out during the ensuing year other necessary alterations, renewals &c. such as the formation of new plots of Plantain trees, various kinds of Limes, Lemons, Citrons and

the like. It is also desirable that the sugar canes, now growing in rather too close a proximity to the western boundary of the garden, should be removed into a more central position, where they will be less liable to abstraction : this change of locality will likewise be beneficial to the canes in other respects and prevent deterioration by too long culture in one spot.

While the orchard and flower garden have thus been freely indented on, the economic department, which still continues to form a main feature of usefulness, has not been overlooked, though the space accorded to it has been necessarily intrenched on. The various plots appropriated for arrow root, tobacco, tapioca, coffee, guinea grass &c have received a due share of attention, and all been made subservient to the general purposes of the Society ; especially coffee, for seeds of which the demand has considerably increased during the last few years. The Council, before leaving this branch of their report, desire to record their approval of the manner in which Mr. Stubbs has conducted the duties of Officiating Gardener since he took charge at the commencement of 1861, and their satisfaction at the general favorable appearance of the garden.

The internecine war on the other side of the Atlantic has naturally attracted great attention to India as the chief source of supply for cotton to meet a probable deficit in the importation into Great Britain during 1861-62 of this most important staple from the Southern States of North America. As during the year 1854 the attention of the Society was much occupied with the subject of Indian fibre-yielding materials in consequence of the war in the Crimea, so at each monthly meeting during the past year communications have been submitted and discussed in respect to improving the indigenous staple, and the suitability of various parts of the country for the culture of superior exotic descriptions. The Executive have fully responded to this movement, as a glance over the proceedings of 1861 will suffice to show. The Cotton Committee have been actively engaged in reporting on the numerous samples on which opinion has been requested from all quarters of the empire. An active correspondence has been carried on with the Manchester Cotton Supply Association, and the Society has acted in conjunction

with Messrs. Mosely and Hurst of this City as their agents in the distribution of large supplies of foreign seed and of machines for separating the fibre from the seed. Upwards of 120 applications have been complied with for American and Egyptian seed from the commencement of April to the close of the year. Each applicant has been supplied with printed copies of directions prepared by the Secretary for cultivating the staple. As each applicant has been requested to communicate the result of his experiments with this seed and these machines, the Council hope to be in a position to lay before the Society during 1862 an interesting and useful statement on the subject. The Executive have by request of Government, acted also as their Agents in supplying seed to the Collectors of Revenue in the Lower Provinces. They have also been in communication with Mr. Paterson Saunders, the Commissioner appointed by the Government of India to report upon the cultivation of cotton. The Society has likewise offered the sum of 500 rupees to the author of an improved essay on the culture of cotton in India from foreign seed, and the Manchester Association have added an equal sum with the view of exciting greater competition: the Essay to be produced on or before the 1st. May 1862. The offer of this prize has been widely disseminated on this side of India through the columns of the newspapers: it has likewise been advertized in the Government Gazette of the Presidencies of Calcutta, Madras and Bombay. In addition to the above the Cotton Committee have tested the working power of the gins (Dunlop's and Wanklyn's) which have been distributed by the Manchester Association; and their reports on these, in competition with another of local manufacture (Macdonald's) have been laid before the Society and printed in the proceedings for October. A memorandum from the Secretary, embodying the result of Mr. C. E. Blechynden's trials and recommendation respecting these machines, was also published in the proceedings of the July meeting, and copies sent to all known to be interested in the subject.

The introduction of improved means of irrigation has engaged a considerable share of the attention of the Society during the past twelve months. The valuable communications of Messrs. Bingham,

Murray and Leslie, will doubtless have been read with interest by many settlers on this side of India; and not on this side only for enquiries for information have been received from more than one resident in the Madras Presidency. It is to be hoped that the attention which has been recently attracted towards so important a matter may result in the introduction of efficient yet simple engines for irrigating purposes not only in the dry months but also during the wet season, when a partial cessation of rain frequently renders thousands of acres of rice cultivation useless for want of a due supply of water at a most critical period, namely, at the time of the formation of the grain.

The Society is indebted to Capt. Hutton, Mr. Cope and other correspondents for much interesting information on the subject of Silk. The continued zealous researches of Capt. Hutton in respect to the wild silk yielders of India, of which our knowledge is still very limited, will, it is hoped, lead to useful practical results. The indefatigable efforts of Mr. Cope towards the establishment of the mulberry worm in certain localities of the Punjab appear likely to prove successful. The reports of the Society's Committee on certain specimens raised under his superintendence are certainly satisfactory and encouraging. In consideration of his active and judicious exertions to increase and improve silk, flax and other products in the Punjab, the Government have given to Mr. Cope one hundred acres of valuable land, in the immediate vicinity of Umritsur, rent free in perpetuity.

The Society has also taken its share in the great interest now excited in respect to the extension of the culture of the Tea plant in various parts of India. Enquiries on the subject have been made from Travancore, Chittagong and other localities where it is supposed the soil and climate are adapted to this important culture. The Society has assisted all such enquirers both by distribution of seed and information; as also by reporting on the first fruits of their culture.

It is gratifying to find that the introduction of the Quinine-

yielding Cinchonas into India, respecting which the Society has for some time past taken much interest, has been progressing satisfactorily during the past year. From a report by Mr. McIvor, the Supdt. of the Ootacomund Garden, which is published in the proceedings for December, it would appear that the imported plants, at present in a green house, are in very fine condition, many of them indeed in the most luxuriant state of health. If they succeed equally well in the open air this locality may prove the nucleus for the propagation and eventual dissemination of these most valuable plants to other equally suitable localities.

The Society has been in active correspondence throughout the past year with residents in various parts of the country, as also with Branch Societies and Public Gardens. The Council would name, more especially, the Societies of a kindred nature at Madras, Bombay and Oude; the Adelaide Philosophical Society, and the Supdt. of the Royal Botanic Garden at Melbourne, with whom interchanges of plants and seeds have been effected. Donations of seeds have been likewise accorded to the Public Garden at Umritsur, which promises to become a most useful Institution, and to the Convict Settlement at Port Blair. From Captain Haughton, the Supdt. of this Settlement, the Society has received for report various parcels of sugar, arrowroot, cotton, gums, dyeing and tanning substances; all which, especially cotton of the finer kinds, for which the soil and climate appear well adapted, are likely to be turned to profitable account at no distant day.

Other subjects of minor importance have also received a due share of attention, but to enumerate them would be tedious. Nor is it necessary, as they have been all more or less fully detailed in the monthly proceedings of the Society. The Council desire, however, to take this opportunity, and in this place, as perhaps the most appropriate, to record their sense of the obligation of the Society to the local newspaper press who have so regularly published its proceedings, and thereby materially assisted in disseminating widely, and without delay, not only to Members, but to the public in general, the various items of useful information which, have from time to time been brought to its notice.

Lastly, the Council beg to mention that two numbers of the Journal, Part 4 of Vol. XI and part 1 of Vol. XII have been published during the year. They contain useful papers on cotton, silk flax, tobacco, vanilla and tea ; on horticultural and floricultural subjects ; on steam machinery and appliances for water raising, &c. &c. Another number is now in the press and will probably be published in the early part of 1862.

The Society has also recently published an useful little work in Bengali entitled *Krishi pátha* (agricultural readings) compiled by Baboo Peary Chand Mittra, one of its Vice-Presidents.

Statement.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December, 1861.

RECEIPTS.

from Members, Subscriptions collected during the year,	Co's. Rs.	19,780	1	9
„ Government Annual Donation,	5,000	0	0	
„ The Right Honorable Earl Canning's annual donation for the year 1861.	500	0	0	
„ Government for American Vegetable seeds for Jail Gardens, ..	668	4	0	
„ Bank of Bengal a Loan on deposit of 4 Govt. promissory Notes Rs. 2,600,	2,000	0	0	
		8,168	4	0
„ Accruings of interest on Government Notes,		761	5	4
„ Proceeds of 7 bales of cotton from the Cotton Supply Association,	308	13	7	
„ Ditto of Sea Island cotton seed,	210	0	0	
„ Ditto of Sugar cane delivered from the Nursery Garden, ..	52	13	0	
„ Ditto of a pair of Bullock from Do.,	15	0	0	
„ Ditto of a Plough for Jail Garden, L. P.	25	0	0	
„ Ditto of fruits graft &c. from the Nursery Garden	867	15	3	
„ Ditto of a portion of surplus Cape, American and Native Vegetable and English flower seeds of 1860-61,	2,821	14	0	
„ Ditto of copies of publications of the Society,	235	7	0	
„ Of old seed boxes,	78	15	0	
„ Ditto of sale of surplus stock of Garden tools,	15	11	0	
„ Members, amount for glazed cases, pots, and packing charges for seeds &c.,	1,394	3	0	
„ Ditto amount repaid for freight on boxes of seeds forwarded in 1860-61,	150	10	0	
„ Amount of contingent expences and coolies wages refunded by Head Gardener,	225	3	3	
		6,403	9	4
	Total Receipts Rs. ..	35,113	4	5
By Balance in the Bank of Bengal on 31st December, 1860, ..	380	2	2	
„ Ditto in the hand of the Secretary on Do	2	9	9	
		382	11	11
	Grand Total Co's Rs.,	35,496	0	4

DISBURSEMENTS.

By Messrs. C. M. Villet and Son for Cape Vegetable seeds supplied in 1861,	2,084	0	0	
„ Messrs. D. Landreth and Son for American Garden seeds supplied in 1859-60,	4,910	9	3	
„ Messrs. James Carter and Co in full of their bills, amounting to £ 414-10-3 for English flower and field crop seeds, supplied in 1860,	4,211	9	6	
„ Messrs. Mackenzie Lyall and Co. for 2 packets of English flower seeds,	20	0	0	
		11,226	2	9
	Carried over Co's. Rs.,			

Statement.

ci

LIBRARY.

Brought forward, Co.'s Rs.,	..	11,226	2	9
Books purchased during the year for the Library,	.. ..	167	3	0
Binding books during the year,	.. ..	131	12	0
		<u>298</u>	15	

PRINTING.

Sundry parties for printing receipts and schedules of prizes for flower show &c. &c.	103	7	0
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JOURNAL.

Bishop's College Press for Printing &c. 1,400 copies of Journal Part 4 of Vol. XI. and Part 1 Vol. XII.,	840	0	0
Calcutta Printing and Publishing Press, for printing Appendix to the above.	.. ..	220	6	0
Certain parties for lithographing plates for Journal,	.. ..	95	0	0
		<u>1,155</u>	6	0

NURSERY GARDEN.

Ordinary expenses incurred on account of the Nursery Garden from 1st December, 1860 to 30th November, 1861,	.. ..	4,885	6	9
Extra Do. for purchase of fruit seedlings for grafting, for glazed cases, pots, for making new roads, widening and repairing old roads, and for sundry other contingent expenses,	.. ..	1,315	6	6
„ James Carter and Co. in full of their bill for plants,	.. ..	277	8	0
„ Dr. T. Thomson, amount remitted for passage &c. for a new Gardener,	.. ..	994	13	0
		<u>7,473</u>	2	3

ESTABLISHMENT.

„ Amount for establishment from 1st December, 1860 to 30th November, 1861,	8,973	10	0
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PECUNIARY REWARD.

„ Prizes to Maltees for vegetables and fruits at Exhibitions held on the 25th January and 28th February, and 2nd April, 1861,	706	0	0
„ Ditto to ditto for flowers at ditto, ditto,	.. ..	336	0	0
		<u>1,042</u>	0	0

COTTON.

„ Messrs. Fischer and Co. proceeds of 2 bales of Oopum cotton sold by Manchester Cotton Supply Association,	.. ..	85	0	0
„ L. Berkely Esq. ditto of 2 bales of cotton sold by ditto,	.. ..	19	12	6
		<u>114</u>	12	6

ADVERTISEMENT.

„ Advertising notices of General Meetings, of shows of vegetables and flowers, distribution of seeds,	297	13	0
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STATIONERY.

„ Stationery for office books &c. for the use of the office,	109	1	0
„ Brown packing paper for packing seeds,	83	0	0
		<u>192</u>	1	0

FREIGHT.

„ Freight on boxes of seeds, books &c. sent and received from Cape of Good Hope, America &c.,	.. ..	482	4	6
Carried over, Co.'s Rs.,	.. ..		

Statement.

LOAN.

Brought forward, Co.'s Rs,

„ Bank of Bengal in repayment of Loan (Rs. 2,000) with interest for 2 months.	2,014 8 9
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FURNITURE.

„ Sundry articles of furniture,	167 0 0
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METCALFE HALL.

„ Society's proportion of Assessment on the Metcalfe Hall from October 1860 to September 1861,	157 8 0
„ Ditto of ditto for lightingtax from October 1860 to September 1861,	42 0 0
„ Mudoosohdun Roy for Society's proportion for inspecting and looking over the Metcalfe Hall Building from April, 1860 to March 1861,	20 0 0
	<hr/> 219 8 0

LAW CHARGES

„ W. H. Smoult Esq. for registering the memorandum of Association in the matter of the Society under Act XXI of 1861,	55 0 0
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LINSEED.

„ Supt. Royal Botanic Garden, Saharunpore, for Linseed for A. and H. Society, Madras,	22 7 0
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PETTY CHARGES.

„ Sundry charges, including postage on letters &c. sent and received and for copies of the Journal,	644 8 6
„ Certain parties for glass jars, flint bottles, and medicines,	34 12 0
„ Extra writer and packermen for sub-dividing and writing on seed papers and for soldering tin boxes and lining wooden boxes with tin, sent to non-resident members, and for other petty charges,	284 10 0
„ Presents to Constables for attending at Horticultural and Floricultural Exhibitions during the year,	72 0 0
„ Messrs. Grindlay and Co. being balance due to them as per account dated 5th October 1860,	72 0 6
Secretary Bank of Bengal for renewing notes, and for fees and commission,	7 12 4
„ Government for income tax on interest on Government Securities,	30 2 0
„ Secretary Bank of Bengal for Stamped fee for Loan (Rs. 2,000,)	4 0 0
	<hr/> 1,149 14 4

Total Disbursements Rs. 34,978 0 1

By Balance in the Bank of Bengal on 31st December, 1861,	499 15 0
„ Ditto in the hands of the Secretary on ditto,	18 1 3
	<hr/> 518 0 3

Grand Total Co.'s Rs. 35,496 0 4

MEMORANDUM.

DISBURSEMENTS

To amount of disbursements during the year 1861, as per statement	34,978	0	1
.. Balance in the Bank of Bengal on 31st December 1861, ...	499	15	0
.. Ditto in the hands of Secretary on ditto, ...	18	1	3
	<u>518</u>	<u>0</u>	<u>3</u>
Total Co.'s Rupees,	35,496	0	4

RECEIPTS.

To amount of receipts during the year 1860 as per statement, ...	35,113	4	5
.. Balance in the Bank of Bengal on 31st December 1860, ...	380	2	2
.. Ditto in the hands of the Secretary on ditto, ...	2	9	9
	<u>382</u>	<u>11</u>	<u>11</u>
Total Co.'s Rupees,	35,496	0	4

Statement.

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LIABILITIES.

Amount due by the Society for American seeds of 1860-61, ...	9,000	0	0
Ditto for Agricultural seeds of 1861 £184.14-6,	1,850	0	0
Ditto for English flower seeds of 1861 £312 ...	3,125	0	0
	<u>13,975</u>	<u>0</u>	<u>0</u>

DEPENDENCIES.

Amount invested in Government Securities lodged in the Bank of Bengal, ...	20,333	5	.
Ditto of Subscription in arrear, ...	10,102	8	9
Ditto outstandings for seeds, grafts, copies of Journal &c., &c. ...	1,759	15	0
	<u>11,662</u>	<u>7</u>	<u>9</u>

LIST OF MEMBERS

OF THE

Agricultural & Horticultural Society

I N D I A.

DECEMBER 31st, 1861.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

OFFICE-BEARERS.

President :

ARTHUR GROTE ESQ.

Vice-Presidents :

W. G. ROSE, ESQ.

S. P. GRIFFITHS ESQ.

BABOO PEARY CHAND BABOO SHIB CHUNDER
MITTRA. DEB.

Secretary and Treasurer :

A. H. BLECHYNDEN, ESQ.

Members of Council :

BABOO RAMGOPAL GHOSE.

S. H. ROBINSON, ESQ.

C. B. WOOD, ESQ.

BABOO GOBIND CHUNDER SEN.

E. PRESTWICH, ESQ.

T. E. CARTER, ESQ.

DR. J. B. BARRY,

C. A. CANTOR ESQ.

RAJAH PERTAUP CHUNDER SING.

H. A. HURST. ESQ.

STEWART DOUGLAS. ESQ.

Patron:**THE RIGHT HONORABLE EARL CANNING, G. C. B.****VICEROY AND GOVERNOR-GENERAL OF INDIA, ETC., ETC., ETC.****List of Members.**

* This Mark denotes Members who have compounded for their Annual Subscriptions

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A. M., F.A.S., London,	1828	1841
Colonel John Colvin, C.B., London,		1830
J. Mackay, Esq.,		
Don Ramon de la Sagra, Island of Cuba,		
Dr. Justus. Leibig, Professor of Chemistry in the University of Giessen,		1843
James Hume, Esq., Magistrate, Calcutta,	1839	1848
Lt.-Col. Francis Jenkins, Commissioner of Assam,	1828	1852
The Right Honorable Sir Lawrence Peel, London,	1842	1856
R. Fortune, Esq., China,		1856
Sir Arthur Buller,	1849	1859

CORRESPONDING MEMBERS.

D. J. Macgowan, Esq. M.D., Ningpo,	1851
Dr. J. V. Thompson, Sydney,	1840
Dr. R. Riddell, London,	1853
Mons. Natalis Randot, Paris,	1858
Capt. Thos. Hutton, F. G. S. Mussorrie,	1861

ASSOCIATE MEMBERS.

Mr. Robert Scott, Head-Gardener, Royal Botanic Garden, Calcutta,	1851
Capt. E. P. Nisbet, London,	1843

ORDINARY MEMBERS.

Admitted.

ABBOTT, Horace, Esq., Sampore Factory, Surdah, ..	1858
Abbott, Col. S. A., Lucknow, ..	1860
Abdool Gunny, Kajec, Zemindar, Dacca, ..	1860
Ackland, C. J., Esq., Calcutta, ..	1855
Ackland, George, Esq., Merchant, Calcutta, ..	1853
Agabeg, J. Esq., Merchant, Calcutta, ..	1854
Agabeg, M. Esq., Merchant, Rangoon, ..	1858
Agabeg, A. L. Esq., Calcutta, ..	1860
Ahmuty, R. Esq., Supt., Govt. Estates, Mymensing, ..	1858
Ainslie,† W. Esq., Civil service, ..	1847
Alexander,† Henry, Esq., Civil service, ..	1846
Alexander,† H. A. R., Esq., Civil service, ..	1855
Alexander, H. W. Esq., Civil service Patna, ..	1861
Allardice,† Geo., Esq., ..	1854
Allan, Dr. James, ..	1858
Allen,† J. H. Esq., Merchant, ..	1850
Allen,† W. J., Esq., Civil service, ..	1850
Allen, Cap. A., (late, 55th N. I.) Roorkee, ..	1860
Allen, Capt. A. S. Cantonment Joint Magistrate, Cawn- pore, ..	1861
Allowallee,* Rajah of Kapoorthullea, Jullunder, ..	1853
Anderson, Andrew, Esq., Sub-Deputy Opium Agent, Fut- tehpore, ..	1861
Anderson, P. Esq., Merchant, Calcutta, ..	1854
Anderson, Thomas, Esq., M. D., F. L. S., Offg. Superin- tendent, Botanic Garden, Calcutta, ..	1861
Anderson, Major, W. W., (1st Bombay Lancers) Supdt. H. H., the Guicowar's Contingent of Horse, Rajkote, Kattywar, ..	1859
Anderson, William, Esq., Merchant, Calcutta, ..	1860
Andrew, David, Esq., Indigo planter, Aurungabad, ..	1851
Andrew, H. Esq., Civil Engineer, Dinapore, ..	1860
Angelo, Elliot, Esq., Merchant, Calcutta, ..	1859
Anley, Arthur Esq., Beshpore, Kishnaghur, ..	1861
Annesley, Capt. R. M. S., (Meywar Bheel Corps,) Kar- warah, Meywar, ..	1858
Apcar, Thomas, Esq., Merchant, Calcutta, ..	1861
Armstrong, C. M., Esq., Opium Dept., Gya, ..	1858
Atherton, H. Esq., Dhurmsala, Punjab, ..	1845
Aubrey, George Esq., Civil Engineer, Cuttack, ..	1861
Augier, P. Esq., Calcutta Mint, ..	1858
Auld,† S. J., Esq., ..	1846
BADGLEY, Lieut. W. F., 30th Native Infy. Moradabad, ..	1860
Baird, Major, A. F. Executive Engineer, Barrackpore, ..	1861
Balfour, G. G., Esq., Civil service, Chittagong, ..	1844
Balfour, Lewis, Esq., Merchant, Calcutta, ..	1842

Barnes, C. H., Esq., Colgong.	1858
Barrow, Col. L., C. B., Oude,	1859
Barry, Dr. J. R., Calcutta,	1856
Barry, † G. R., Esq., ..	1849
Barry, Thomas H., Esq., Merchant, Calcutta,	1856
Battersby, † Arthur, Esq., Indigo-planter, ..	1855
Baugh, Capt. F. W. (18th N. I.,) Almorah,	1855
Bax, J. H., Esq. Civil service, Benares,	1855
Bayley, H. V., Civil service, Calcutta	1855
Bayley, Stuart Colvin, Esq., Civil service, Patna, ..	1859
Beadon, Honble C. Civil service, Calcutta, ..	1855
Bean, Capt. John, Cantonment Magistrate, Rawul Pindee, .	1859
Bean, J. Esq., Sub-Deputy Opium Agent, Monghyr,	1850
Beatson Dr. J. F., Surgeon General Hospital, Allahabad, .	1861
Beaufort, Francis L., Esq., Civil service, Calcutta, ..	1838
Becher, William, Esq., Gowhatti, ..	1855
Beddy, H. W., Esq., Principal Assist. Commisioner of Sandoway, ..	1855
Beeby, G, O. Esq. Solicitor, Calcutta, ..	1861
Begbie, † C. N, W. Esq., Merchant, ..	1854
Begg, † Dr. D. .	1850
Bell, J. D., Esq., Barrister-at-law. .	1855
Bennet, T. B., Esq., Indigo-planter, Purneah, ..	1854
Bennett, † T. H., Esq., Merchant, ..	1857
Bentall, * † Edward, Esq., Civil service, ..	1837
Berkeley, L., Esq , Officiating Sudder Ameen, Delhi, ..	1855
Berkley, R., Esq., Assist.-Commissioner, Mulaon, ..	1857
Berrill, W., Esq., Allahabad, ..	1857
Bhukt, Col. Hurry, Nepalese Ambassador, Calcutta ..	1860
Bindabun. Chunder Mittra, Baboo, Calcutta, ..	1853
Bingham, R. W., Esq., Chynepore, near Sasseram, ..	1859
Birch, Major-General, Sir R. J. H., C. B., Secretary to Government, Military Department, Calcutta, ..	1841
Birch, Captain R. C., Senior Assist.-Comr. Ghota Nagpore, ..	1858
Birney, † Lieut. J., Bengal Engineers, ..	1859
Bishop, * Major H. P., (Artillery,) Bareilly, ..	1853
Bissumbhur Sing, Baboo, Zemindar, Soorool, ..	1857
Blacker, G. M., Esq., Merchant, Calcutta, ..	1856
Blake, Major H. W., Comg. Pegu Police Battn., Rangoon, ..	1858
Blake, G. D., Esq , Indigo-Planter, Coulpoorah Fact, Tirhoot ..	1861
Blechynden, R., Esq Merchant, Calcutta, ..	1858
Blechynden. A. H. Esq., Secy. Agri-Horticultural Socy. of India, Calcutta, ..	1851
Blunt, Capt. A. Commanding 8th Bengal Police, Bn. Cuttack, ..	1861
Blyth, † Philip, Esq , Merchant, ..	1857

Bobily, Rajah of Vizagapatam,	1860
Boileau, Major, G. W., Comdt. Oude Military Police, Seetapoore,	1859
Boldero,† E. J., Esq., Civil service,	1860
Bonavia, E., Esq., M. D., Assist. Surgeon, Lucknow,	1859
Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Monghyr,	1855
Bowers, J. F., Esq., Indigo-Planter, Purneah,	1851
Bracken, Capt., R. D' O. C., 2nd in Command 2nd Seik Local Regt. Punjab,	1860
Braddon, E. N. C. Esq., Assist. Commissioner, Sonthal Per- gunnahs, Deoghur,	1858
Braddon, Henry, Edward Esq., Merchant, Calcutta,	1860
Brae, T., Esq., Indigo-Planter, Hatberria, Jessore,	1854
Brandis, Dr., D. Supt. of Forests, Rangoon,	1857
Brett, Walter, Esq., Calcutta,	1861
Brice, N. Esq., Dinapore,	1859
Bridgman, J. H. Esq., Indigo-planter, Gorruckpore,	1856
Brine, Frederick, Esq.; Darjeeling,	1857
Bristow, Capt. J. W., (19th N. I.,) Depy.-Comr., Mo- zufferghur, Punjab,	1855
Brodhurst, M. Esq., Civil service, Ghazeepore,	1859
Brodie,*† Major T.,	1836
Bronche, W. J., Esq., Indigo-planter, Dheree,	1859
Brooke, Lieutenant-Colonel John C., Commandant Meywar Bheel Corps, and Assistant Political Agent in Meywar Neemuch,	1843
Brooke, R. P. Fsq., Bubnowly, Gorruckpore,	1861
Brownlow, Major H. A., (Engineers,) Supt. Eastern Jumna- Canals, Saharunpoor,	1858
Brown, Forbes Scott, Esq., Merchant, Penang,	1840
Brown, Brigr. W. G., (H. M. 24th Regt.) Comdg. at Delhi,	1852
Brown, Capt. D., 1st Madras Fusiliers, Assist.-Commis- sioner, Bassein, Burmah,	1856
Brown, George, Esq., Merchant, Calcutta,	1856
Brown,† John, Esq., Merchant,	1858
Bruckner, A. Esq., Merchant, Calcutta,	1860
Buckle, W. B. Esq., Civil service, Chittagong,	1860
Bullen,† John. N. Esq., Merchant,	1859
Buller,*† Frederick Pole, Esq., Civil service,	1837
Bunbury, Capt. W. D., Roy Bareilly, Oude,	1861
Burbank, Capt. Charles, Comg. H. C. Steamer "Fire Queen," Calcutta,	1857
Burnett, Lieut.- Col. F. C., Bengal Artillery, Jullundur,	1839
Burrows, Henry, Esq., Railway Contractor, Shahabad,	1860
Burton, John St. Edmund, Esq., Calcutta,	1850
Buzlall, Rhoman, Monshee, Zemindar, Sealdah,	1857

CADOGAN, T. C., Esq., Merchant, Calcutta,	1858
Cameron, J. T. D., Esq., Head-Master, La Martiniere, Cal., ..	1853
Campbell, W. F., Esq., Tipperah,	1838
Campbell,* Archibald, Esq., M. D., Medical Service, Superintendent of Darjeeling,	1838
Campbell, T. A., Esq., Palamow,	1851
Campbell,† Capt., A. M., (16th M. N. I.)	1855
Campbell, Capt. Ivie, Enam Commr., Ellichpore,	1854
Campbell, Capt. A. H., Comg. 8th Irr : Cavalry, Seetapoor, Oude,	1859
Campbell,† Lieut. Henri, (12th Regt. N. I.)	1856
Campbell, Archd Esq., Extra Asst. Commr. Assam,	1861
Canning, The Right Hon'ble, Charles John, Earl,	1856
Cantor, C. A., Esq., Merchant, Calcutta	1851
Carbery, R. J., Esq., Calcutta,	1853
Carew, R. R., Esq.,	1846
Carnegy,† P., Esq., Assist-Commissioner,	1857
Carter, T. E., Esq., Merchant, Calcutta,	1852
Carter, P. P., Esq., Bhojepore, Buxar,	1861
Cave,† Charles, A, Esq., Indigo-planter,	1857
Cave, H. S., Esq., Indigo-planter, Purneah,	1852
Cavenagh, Lieut.-Colonel O., Governor of the Straits Settlements	1848
Cayley, H. Esq., Civil Surgeon, Goruckpore,	1861
Chamberlain, Capt. Chas., Oude Police,	1859
Chamberlain, Capt. T. H., (3rd European Regiment,) Asst. Supt. of Thuggee, Lucknow,	1860
Chamier, Capt. E., Deputy Commissioner Barr Banka, Oude,	1860
Champneys,† Lieut.-Col., E. G.,	1848
Chandler, E. J., Esq., Sub. Collector, Cawnpore,	1860
Cheek Alfred H., Esq., Civil Surgeon, Benares	1855
Cheek, J. M. G., Esq., Bancoorah,	1860
Chichester Lieut. Coll the Hon. A. G. C. H. M.'s 77 Regiment, Hazareebaugh,	1861
Church, James, Esq., Merchant, Calcutta,	1850
Church,† James, Esq., Junior, Merchant,	1851
Clark, A. N., Esq., Allahabad,	1856
Clark, Dr. Stewart, Inspector Genl. of Prisons, N. W. P.,	1855
Clarke, H. R., Esq., Civil service, Bareilly,	1856
Clarke,† John, Esq.,	1855
Clarke, G. R., Esq., Indigo-planter, Roodeipoor <i>via</i> Bongong,	1855
Clarke, Longueville, Esq., R. R. S., Barister, Supreme Court, Calcutta,	1839
Cleghorn, Dr. H., Madras,	1858
Clemen, Edward, Esq.,	1855
Clerk, Dr., D. G., Calcutta,	1856
Clerk, Lieut. Malcolm G., (D. P. W.) Lucknow,	1858
Cleve, T. A., Esq., Tea-planter, Darjeeling,	1860

	<i>Admitted</i>
Cockburn, † G. F., Esq., Civil service,	1856
Cockburn, Wm., Esq., Raneegunge,	1846
Cockburn W., Esq., Indigo-planter Dhera Ghat, Grand Trunk Road,	1861
Cockerell, Capt. J., Comg. Divisional Battn. of Police, Benares,	1860
Cockerell Horace Esq., Civil service, Berhampore,	1861
Collins, Dr., J. C., Civil Surgeon, Darjeeling,	1856
Collis, S. E., Esq., Solicitor, Calcutta,	1859
Colville, *† Sir J. W.,	1849
Colvin, J. C., Esq., Civil service, Phileebhit,	1861
Cooke, H. W., Esq., Sub-Depy. Opium Agent, Bhangul-pore,	1857
Cooke, C. N., Esq., Depy-Secretary, Bank of Bengal,	1849
Cope, Henry, Esq., Merchant, Umritsur,	1847
Cornell, W., Esq., Civil service, Balasore,	1861
Cosserat, P., Esq., Ghazeepore,	1857
Cosserat Lewis, Esq., Indigo-planter, Lall Seraiah, Chumparun,	1859
Cossinauth, Chowdry, Boboo, Cossipore,	1849
Cowell, † James, Esq., Merchant, Calcutta,	1838
Cowie, * Henry, Esq., Merchant,	1837
Cox, † Major-General H. C. M.,	1838
Cox, † J. H. W., Esq., Indigo-planter,	1845
Craster, † E. C., Esq., Civil service,	1858
Craster, Lieut. G. A., Engineers, Noorpore, Punjab,	1855
Crawford, † J. A., Esq., Civil service,	1857
Creswell, C. E. Esq., Merchant, Calcutta,	1855
Crommelin, C. R., Esq., Deputy Commissioner, Roy, Bareilly,	1860
Crommelin, Lieut-Col., J. A., Darjeeling,	1857
Crooke, Henry, Esq., Merchant, Calcutta,	1858
Crump, R. W., Esq., Monjoul Factory, Monghyr,	1859
Cumming, William, Esq., Indigo-planter, Malda,	1851
Cunliffe, † R. E., Esq., Civil service,	1851
Cunliffe D., Esq., Civil service. Hidgelee,	1861
Currie, Charles, Esq., Civil service, Lucknow,	1855
Curtis, J. F., Esq., Indigo-planter, Tirhoot,	1860
DACRUZ, J. F., Esq., Indigo-planter, Chynepore, Shahabad	1861
Dalton, Major E. T., Commissioner of Chota Nagpore,	1848
Dampier, † H. L., Esq., Civil service,	1857
Dashwood, H. W. Esq., Civil service, Banda,	1860
Daunt, W., Esq., Indigo-planter, Peepra, Champarun,	1857
Davidson, James Esq., Tea-planter, Cachar	1861
Davies Capt. T., Commt. Behar Police, Bouldanah	1855
Davies J. S., Esq., District Supdt. of Roads, Bograh,	1859

Davis, Capt. J. S., Senior Assist.-Commissioner Chota-Nagpore,	1857
Davis, H. M., Esq., Civil Surgeon, Noacolly,	1856
Davis, Dr. J. Civil Surgeon, Bassein,	1860
D'Cruz, A., Esq., Junior, Secretariat Govt. of India,	1852
Dear, Herschel., Esq., Monghyr,	1860
Dearman, George, Esq., Merchant, Calcutta,	1845
Degumber, Mitter, Baboo, Merchant, Calcutta,	1858
DeMornay,† H., Esq., Managing Director, Assam Company,	1843
Dennchey, Capt. T. Commanding Allahabad Divisional Military Police Battn.	1860
Depree, Capt. G. C., (Artillery) Assistant Surveyor General, Ranchee	1861
Denonauth Mundul, Calcutta,	1861
DeSaran, Eugene Dubois, Esq., Cootooreah factory, Kishnaghur,	1858
Deverell, H., Esq., Indigo-planter, Ackergunge factory, Berhampore	1854
Dickey,† Capt. Wm.,	1858
Dickens, Capt. C. H., Artillery, Calcutta,	1856
Dickey, Col. E. J., Supt., of Studs, Meerut,	1851
Dickson, T., Esq., Calcutta,	1859
Dixon, Lieut. Alfred, Bengal Horse Artillery, Benares,	1860
Dombal, M. E. Durup de, Esq., Monghyr,	1860
Dorin,† Joseph Alexander, Esq.,	1837
Douglas, Francis, Esq., M. D., Civil Surgeon, Lucknow,	1859
Douglas, Stewart, Esq., Merchant, Calcutta,	1851
Doveton, H. Esq., Deputy-Magistrate, Buheera, Tirhoot,	1855
Doyne, Richard, Esq., Barrister-at-law, Calcutta,	1855
Drabble,† R. R., Esq., Merchant,	1850
Drew, Capt. H. R. Commandant Kamroop Regiment, Furreedpore,	1860
Drummond,† The Hon'ble R., Civil service,	1852
Drury, Capt. C. C. Goruckpore,	1860
Dwarkanath Mullick, Baboo, Calcutta,	1859
Dumergue, J. S., Esq. Civil service, Allyghur,	1847
Duncan, R. Esq., Howrah,	1859
Dunford, Hamilton E. A., Esq., Bengal Yeomanry Cavalry, Hoshingabad,	1856
Durand, P., Esq., Indigo-planter. Jessore,	1852
Durrschmidt,† Chas., Esq., Merchant,	1847
Dyer, A. K. Esq., (Mercantile Bank) Ceylon,	1860
EAMES, R Esq., Merchant, Calcutta,	1855
Earle, Dr , F. J., Civil Sugeon, Purneah,	1859
Eddis,† W. U., Esq.,	1858
Edgeworth,† Michael Pakenham, Esq., Civil service,	1836
Edwards,† The Honble. G. W. Governor of Labuan,	1860

Admitted.

Egerton., James, Esq., Cahah factory, Purneah,	1856
Eliot, Col. John, Artillery, Sealkote	1839
Elliot J. B., Esq., Patna,	1851
Elliot, J. Scott, Esq., Merchant, Calcutta,	1851
Elliott,† W. Henry, Esq.,	1839
Elphinston Capt. C. N. Deputy Commissioner, Jullunder, ..	1861
Erskine, H. C., Esq., Indigo-planter, Elambazar, Paneeghur,	1855
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Ritchie, the Honble. W. Advocate-General, Calcutta, ..	1851
Roberts, J. B., Esq., H. M. Coroner for Calcutta, ..	1858
Robinson, S. H., Esq., Merchant, Calcutta, ..	1854
Robinson, T. M., Esq., Merchant, Calcutta, ..	1848
Rogers, Archibald, Esq. Solicitor, Calcutta, ..	186
Rogers;† George, Esq., Solicitor, ..	1858
Roghè, A. W., Esq., Merchant, Akyab, ..	1859
Rome,† James, Esq., Merchant, ..	1859

Rouquet, V. Esq., Indigo-planter, Moharajgunge Factory, Azimghur,	1860
Rose, Henry, Esq., Civil service, Chaprah,	1846
Rose, W. Grant, Esq., Merchant, Calcutta, (<i>Vice President</i>),	1837
Rose, Richard, Esq.,	1860
Ross, Alexander, Esq., Civil service, Agra,	1858
Ross,† J. G., Esq.,	1852
Ross, R. F., Esq., Merchant, Calcutta,	1855
Ross, Lieut. D. Adj. 1st Assam Battalion, Debrooghur,	1858
Ross, Andrew Esq., C. S. Azimghur,	1859
Row, Capt. W. S. (33rd N. I.), Hazareebaugh,	1854
Rowlatt, Capt. E. A., Principal Assist-Commr. of Assam,	1855
Ruffeoodcen, Prince Mahomed, Russapuglah, near Tally-gunge,	1851
Rummanauth Gossain, Zemindar, Serampore,	1857
Russel, A. E., Esq., Civil service, Berhampore,	1847
Russel, R. H., Esq., Civil service, Burrisaul,	1855
Ruxton, G. Esq., Merchant, Calcutta,	1861
Ryder, Lt. C. D., 2nd Gwalior Infy, Jhansec,	1858
SAGE,† Major Genl W.	1845
Sagore Dutt, Baboo, Merchant, Calcutta,	1850
Salmon, Capt. W. T. Secretary India General Steam Navigation Company, Calcutta	1861
Sanders, Col. Arthur, Dinapore,	1859
Sandes, Falkner C. Esq., Solicitor, Calcutta,	1855
Sandes,† M. F., Esq.,	1851
Sandys, J. U., Esq., Allahabad,	1855
Sapte,† Brand, Esq., Civil service,	1851
Saubolle, C. A., Esq., Nopara, Kishnaghur,	1857
Saunders,† John O'Brien, Esq.,	1856
Savi,† John Robert, Esq., Indigo-planter,	1836
Savi, Thomas, Esq., Indigo-planter, Kishnaghur,	1851
Sawers, A. S. Esq., Indigo Planter, Culna	1861
Schalch, Vernon, Esq., Civil service, Jessore,	1859
Schiller, F., Esq., Merchant, Calcutta,	1854
Schilling, G., Esq., Talookdar, Luckunpore, Oude,	1860
Sconce, Archibald, Esq., Civil service,	1839
Scott, Dr. D., Medical service, Allahabad	1852
Scott, Lieut. J. F. O., Adj. Sylhet Light Infy. Cherra,	1858
Scott, Lieut. Col. E. W., Inspector Genl. of Ordnance, Calcutta,	1859
Secretary for the time being, Artillery Head Quarter Mess,	1858
Secretary Public Garden, Lucknow,	1858
Secretary Local Fund Committee, Goorgaon,	1860
Secretary Public Garden, Cawnpore,	1860
Secretary Public Garden, Monghyr,	1853
Secretary Local Committee, Allahabad,	1851

Secretary Local Committee, Mynporee,	1850
Secretary Horticultural Garden, Etawah,	1856
Secretary Public Garden, Banda,	1855
Secy. Local Fund Committe, Umritsur,	1859
Seey. Local Committee, Hummeerpore,	1859
Secy. Local Fund Committee, Ferozepore,	1861
Secy. Landholder's Society, Rungpore,	1861
Seton-Karr,† W. S., Esq., Civil service,	1859
Seymour, S. F., Esq., Calcutta,	1853
Shakespear, A. Esq., Civil service, Benares,	1860
Sham Churn Mullick, Baboo, Calcutta,	1857
Shamachurn Law, Baboo Merchant, Calcutta,	1855
Shamchand Mittra, Baboo, Merchant, Calcutta,	1854
Sharpe, the Rev. James, Chaplain, Mussooree,	1843
Shawe,† M., Esq., Civil service,	1842
Shearin, E. Esq., Merchant, Calcutta,	1856
Sherer, Capt. J. F., Deputy Superintendent of Cachar	1861
Sheridan, A. J. R., Esq., M. D., Soory,	1860
Sherriff, W., Esq., Jorradra, Jessore.	1859
Shib Chunder Deb, Baboo, Deputy-Collector, Calcutta, (<i>Vice President</i> ,)	1847
Shillingford, Jos., Esq., Indigo-planter, Purneah,	1853
Shore, R. N. Esq., Civil service, Cuttack	1861
Simson, James, Esq., Civil service, Allahabad,	1856
Simson, D., Esq., Civil service, Bairatch, Oude,	1854
Skinner, A., Esq., Hansi,	1854
Skinner, C. B., Esq., Civil service, Jessore,	1856
Skinner, Lieut. R. M., (56th, N. I.) Adjutant Ramghur Irr. Cav. Dorundah,	1859
Slade, James, Esq., Indigo-planter, Tirhoot,	1855
Smith, Adam Hume, Esq., Indigo-planter, Jessore,	1857
Smith, George, Esq., Indigo-planter, Tirhoot,	1858
Smith, J. White, Esq., Indigo planter, Kattullee, Kishnaghur,	1854
Smith, Lt. Col. E., Fleetwood, Supdt. Keddah Establish-ment, Dacca,	1852
Smith,† Rev. Thomas, of the Free Church Institution,	1857
Smith, J. Gow, Esq., Indigo-planter, Rutenpore Facto-ry, Kishnaghur,	1859
Smith, R. H., Esq., Principal Sudder Ameen, Benares,	1860
Smith, James, Esq., Nizamabad Factory, Azimghur,	1860
Smyth,† Capt. J. H., (Artillery,)	1851
Sonatun Bysack, Baboo, Calcutta,	1858
Soorauth Nauth Mullick, Baboo, Zemindar, Ishera,	1858
Southern,† W., Esq., Civil Engineer,	1860
Squire, Robert, Esq., Agriculturist, Golah Ghat, Upper Assam,	1855
Squire,† Dr. John, 3rd Seikh Infy.	1860

Sreekissen Sing, Baboo, Calcutta,	1835
Staig, Charles S , Esq , Supt. E. I., Coal Company, Ran- neegunge,	1859
Stalkartt, † William, Esq , Merchant,	1845
Stalkartt, John Esq., Indigo Planter Setulpore Factory, Chuprah,	1861
Stainforth, Lieut. R Police Corps, Gonda, Oude,	1860
Stanton, Capt. F. S , (Engineers,) Calcutta,	1857
Steel, Donald, Esq., Eastern Cachar Tea Company,	1861
Steer, Charles, Esq, Civil service, Calcutta,	1853
Stephen, J., Esq., Dacca,	1855
Sterndale † R. A. Esq.,	1859
Sterndale, W. C., Esq., Mirzapore,	1856
Stevenson, * † William, Esq., Junior, M. D.,	1834
Stewart, C. B., Esq., Merchant, Calcutta,	1854
Stewart, Wm, McAdam, Esq., Merchant, Calcutta,	1851
Stewart, W. M, Esq , Dulsing Serai, Tirhoot,	1859
Stewart, Capt. John, Depy. Comr. of Ordnance, Cawnpore,	1860
Stewart Stair A. Esq , Civil Engineer, Bongong,	1861
Story, Major-General, F P, C. B., Cawnpore,	1854
Strachey, † Lt.-Col. R., (Engineers,)	1857
Stuart, † James, Esq., Merchant,	1847
Swaine, C Esq., Indigo-planter, Contai, Tirhoot,	1860
Sumbonauth Pundit, Baboo, Pleader, Sudder Court, Cal- cutta,	1853
Sumboo Chunder Roy, Chowdory, Zemindar, Rungpore,	1860
Sutherland, Charles J., Esq., Merchant, Calcutta,	1838
Sutherland, Dr. John, Civil Surgeon, Patna,	1859
Sutherland, H. C., Esq., Civil service, Dacca,	1860
Sutish Chuender Roy, Bahadoor, Moharajah of Nuddea, Kishnaghur,	1857
Suttoshurn Ghosal, Bahadoor, Calcutta,	1856
Swinden, T. G., Esq., Calcutta,	1855
Swinhoe, William, Esq., Attorney, Calcutta,	1859
Syed Ahmed Ally, Nawab, Calcutta,	1861
TAYLER W. Esq., Patna,	1853
Taylor, G. B., Esq., Benares,	1858
Taylor, W. C., Esq., Assist-Comr., Sonthal Pergunnahs, Nya-Doomka,	1858
Taylor, Villiers Esq., Civil service, Bancorrah,	1860
Teil, † Thos., Esq., Merchant,	1855
Terry, W., Esq., Indigo-planter, Midnapore,	1846
Thelwall, Major. J. B., C. B. Com. 9th Punjab Infantry, Fyzabad	1851
Thomas, R. M., Esq., Solicitor, Calcutta,	1849
Thomas, Col. Charles Thynne, Dehra-Doon,	1858
Thomfason, † Lieut. C. S., H. M. Bengal Engineers,	1860

Thompson Capt. E., Deputy-Com. Seetapore, Oude, ..	1859
Thomson,† Thomas, Esq., M. D., Supt. Royal Bot. Garden, Calcutta, ..	1855
Thompson Mr. A. B. F. Merchant, Calcutta ..	1861
Thomson, William, Esq., Merchant, Calcutta, ..	1848
Thomson, William, Esq., Superintending-Surgeon, Dacca,..	1859
Tickell, Capt. J. Cantonment magistrate, Delhi ..	1861
Toogood, Octavius Esq, Civil service, Cuttack ..	1861
Townsend,† M. W., Esq., ..	1858
Travers, Lt. Col. J., Sehore, ..	1850
Trevor, Edward Tayler, Esq., Civil service, Bauleah, ..	1844
Tripp, H. D., Esq., Indigo-planter, Salgumudea, Commer-Colly, ..	1852
Trotter, T. C., Esq., Civil service, Patna, ..	1856
Tucker,† Henry Carre, Esq., Civil service, ..	1837
Tucker,† W. T., Esq., Civil service, ..	1855
Tucker, W. H. Esq. Civil service, Allahabad ..	1861
Tulloh, Capt. R. H. Executive Engineer, Azimghur, ..	1860
Tulloh, Capt. J. S. Artillery, Jullundur ..	1861
Turnbull, C. S., Esq., Silk manufacturer, Ghuttal ..	1859
Turnbull, G. D., Esq., Civil service, Meerut, ..	1853
Turnbull, Lieut.-Col. A. D., (Bengal Engineers,) Supdt. Genl. of Irrigation, N. W. P., Roorkee, ..	1851
Turner,*† Thos. Jacob, Esq., Civil service, ..	1836
Twynau, Lt. E. J. L., Executive Officer, Arracan, Akyab, ..	1856
.	
VARDEN, A. M., Esq., Merchant, Calcutta. ..	1851
Vertue,† Lieut. J. S., (Madras Engineers,) ..	1859
Vetch,† Col. H., Assam ..	1842
Vincent, Capt. F. F., 16th Regt. N. I. Shanghai, China, ..	1859
Vincent, E. L., Esq., Civil Engineer, Monghyr, ..	1859
Vizianagram, His Highness the Rajah of, ..	1847
Vos, J. M., Esq., Assessor of House Tax, Calcutta, ..	1847
.	
WAGENTRIEBER, W., Esq., Tea-planter, Debroghur, ..	1857
Walker, Alexander, Esq., Merchant, Calcutta, ..	1855
Walker, G. A., Esq., Tea Planter, Chincooree Tea Gardens, Cachar, ..	1861
Wallis,† J. J., Esq., Merchant, ..	1856
Walters,*† Henry, Esq., ..	1836
Ward, J. D., Esq., Civil service, Chittagong, ..	1857
Warner, J. E., Esq., Indigo-planter, Kishnaghur, ..	1856
Warwick,† B., Esq., Merchant, ..	1849
Waterfield, E., Esq., Civil service, Balasore, ..	1846
Watson,† Hartly, Esq., C. E., ..	1858
Watson,† John, Esq., Merchant, ..	1852
Wauchopé, S., Esq, Civil service, Calcutta, ..	1848
Wavell,† Wm. Esq., Civil service, ..	1859

	Admitted
Weld, Capt. George, Chunar,	1861
Wemyss, Sir John, Bart., Berhampore,	1859
Weskins, Charles, Esq., Merchant, Calcutta,	1854
West, C. H., Esq., Merchant, Lahore,	1850
Whampon, Mr., Merchant, Singapore,	1850
Whinfield, E. H., Esq., Civil service, Gya,	1860
Whitney, W. M., Esq., Merchant, Calcutta,	1860
Wienholt, W., Esq., Merchant, Calcutta,	1848
Weinholt, John Esq., Merchant, Calcutta,	1859
Wight, *† Robert, Esq., M. D.,	1836
Wilcox Lt. E. R. C., Cantonment Magistrate, Lucknow ..	1861
Williams Capt. E. C. S. Bengal Engineers, Roorkee, ..	1861
Williams, Fleetwood, Esq., Civil service Meerut,	1840
Williamson, Lieut. James, Commandant 18th Regt. Punjab, N. I., Moradabad,	1849
Williamson, Geo., Esq., Cumamara Tea Factory, Jorehaut, Assam,	1858
Williamson, George, Esq., Junior, Jorehaut, Upper Assam,	1860
Williams, J. Esq., Meezywar Agency, Neebuch,	1859
Willis, Joseph, Esq., Merchant, Calcutta,	1827
Willcock, † H. D., Esq., Civil service,	1855
Wilmot, C. W., Esq., Assist. Commissioner, Sonthal Pur- gunnahs, Pakour <i>via</i> Jungypore,	1859
Wilson, A., G., Esq., Deputy-Magistrate, Burhee,	1847
Wilson, Thomas, Esq., Deputy Opium Agent, Ghazee-pore,	1848
Wilson, Charles Esq., Civil Surgeon, Roorkee,	1860
Wilson, Major, H. M., Comg. Hill Rangers, Bhaugulpore,	1860
Wilson, J. F. E., Esq., District Engineer, E. I., Railway, Soorool,	1860
Wilson, Charles, H., Esq., Merchant, Calcutta,	1860
Wilsone, C. M. Esq., Munglepore,	1853
Wingrove, † E., Esq., Merchant,	1846
Wingrove, † G. W., Esq., Merchant,	1856
Wingfield, † C. J., Esq., Civil service,	1855
Wintle, Charles F., Esq., Sub-Deputy Opium Agent, Futteh- pore,	1859
Wintle, Capt. E. H. C., late 61 st Regiment N. I., Cal- cutta,	1860
Wood, C. B. Esq., Merchant, Calcutta,	1856
Wood, J. N. T., Esq., Merchant, Calcutta,	1854
Wood, R. A., Esq., Tea-planter, Cachar,	1858
Woodcock Capt. (Bombay Army,) District Supt. of Oude Police, Gonda,	1860
Worsley, J. T., Esq., Deputy-Magistrate, Nowada, ..	1859
Wray, † G. O., Esq.,	1857
Wright, H., Esq., Shahpore, Punjab,	1854
Wroughton, Capt. H. R. Sub-Ass. Commissary General Meean Meer	1861

	<i>Admitted.</i>
Wyatt, G. N., Esq., Indigo-planter, Peeprah, Mootehary, ..	1860
Wylie, Macleod, Esq , Secy. to the Legislative Council,	
Calcutta,	1844

UNIVERSAL ASSURANCE SOCIETY FOR LIVES,

ESTABLISHED IN LONDON AND CALCUTTA, 1834.

Confirmed by Special Act of Parliament 6, William IV. Chap. 64.

**Invested Capital Seventy-five Lakhs of Rupees, of which
One-half is Held by the Indian Branch.**

LONDON OFFICE, NO. 1. KING WILLIAM STREET.

Secretary,—M. E. IMPEY, Esq.

Indian Branch.

DIRECTORS, CALCUTTA:

WILLIAM H. SMOULT, ESQ.	CLAUD H. BROWN, ESQ.
JOHN NUTT BULLEN, ESQ.	J. SCOTT ELLIOT, ESQ.
CHARLES SWINTON HOGG, ESQ.	

LOCAL DIRECTOR AT ALLAHABAD:

CECIL STEPHENSON, Esq.

PHYSICIANS.

ALLAN WEBB, Esq., M. D.

AGENTS AND SECRETARIES.

MESSRS. BRADDON & Co.

MADRAS AGENTS.

**MESSRS. BAINBRIDGE, BYARD
& Co.**

BOMBAY AGENTS.

MESSRS. LECKIE & Co.

THE marked success which has for upwards of twenty-five years attended the operations of this Society, justifies the Directors in calling the attention of the public to the *following advantages* held out to all classes desirous of effecting Assurances on Lives.

1st The Insured in the Society have a most satisfactory guarantee for the settlement of claims in the *large Capital of the Institution*, not merely subscribed, but actually invested, amounting to £7,50,000, of which one-half is held by the Indian Branch, and immediately available, being an amount greatly in excess of the Capital of any similar Society in India.

2nd. Avoiding hazardous competition the Directors of the *Universal* have adopted Tables of Premium constructed with the utmost care. The rates for India were originally prepared from the most comprehensive data, exclusively obtained by this Society from the records of the India House, and these rates have recently been carefully investigated by two of the most eminent Actuaries in London (*viz* Messrs. Peter Hardy and Charles Jellicoe) and the result, after a laborious enquiry, has established the fact, that the present Indian rates are as moderate, with reference to the risk incurred, as is consistent with perfect security to the Assured, and to a Society which returns to them three-fourths of its profits.

3rd. Assurances may be effected for whole life either on a scale entitling the assured to participate in the profits of the Society, or at a lower rate of premium without such participation. Also for short periods from one to seven years, on very moderate terms.

4th. The profits are ascertained *each year*, and declared on the second Wednesday in May, when all those insured on the profit scale who have paid six annual premiums on their policies are entitled to participate therein.

5th. One-fifth of the ascertained profits of the five preceding years is divided between the Policy-holders and Shareholders—three-fourths or *seventy-five* per cent to the former, and one-fourth to the latter. The remaining four-fifths are set apart to enter into the average of the succeeding years, and thus to provide against unforeseen contingencies.

6th. The Assured have the option of appropriating their profits to the immediate reduction of their premiums, or as a bonus to be added to the sum assured.

7th. The practice of an *annual* division “distributes the profits with more regularity and justice than any other,” and is in many respects preferable to triennial, or other modes of division.

8th. The first division of profits took place in 1840; the annual reduction of premium has averaged 44 per cent, and notwithstanding the extraordinary claims consequent upon the Indian mutiny, a *reduction of 40 per cent* was declared at the last Annual General Meeting on all Policies entitled to participate—dated prior to the 9th May 1855.

9th. It is most important that all intending Assurers should consider well not only the rate of premium primarily charged, but also the percentage of profits actually granted (*annually* by this Office) in reduction of such premium.

10th. The following is an extract of the Rates of Premium for an Assurance of Company's Rupees One Thousand :—

CIVIL.

Age.	ONE YEAR.		THREE YEARS.		FIVE YEARS.		SEVEN YEARS.	
	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.
	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
20	11 0	5 8	11 0	5 8	11 8	5 12	12 0	6 0
30	13 8	6 12	14 0	7 0	14 0	7 0	14 8	7 4
40	16 0	8 0	16 0	8 0	16 0	8 0	16 8	8 4
50	19 0	9 8	20 0	10 0	20 0	10 0	21 8	10 12

MILITARY.

Age.	ONE YEAR.		THREE YEARS.		FIVE YEARS.		SEVEN YEARS.	
	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.	Half-yearly.	Quarterly.
	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
20	13 0	6 8	13 8	6 12	14 0	7 0	14 0	7 0
30	16 0	8 0	16 0	8 0	16 8	8 4	17 0	8 8
40	19 8	9 12	20 0	10 0	20 0	10 0	20 0	10 0
50	22 8	11 4	23 0	11 8	23 8	11 12	24 0	12 0

Intermediate Ages in Proportion.

Following is an extract of **WHOLE LIFE** rates.

CIVIL.

Age.	WITH PROFITS.				WITHOUT PROFITS.			
	Half-yearly.		Quarterly.		Half-yearly.		Quarterly.	
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.
20	21	0	10	8	16	0	8	0
30	24	0	12	0	19	8	9	12
40	29	8	14	12	24	8	12	4
50	37	0	18	8	31	0	15	8

MILITARY OR NAVAL.

Age.	WITH PROFITS.				WITHOUT PROFITS.				ANNUAL ENGLISH RATES.		
	Half-yearly.		Quarterly.		Half-yearly.		Quarterly.				
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	£.	s.	d.
20	23	8	11	12	18	0	9	0	1	18	8
30	27	0	13	8	22	8	11	4	2	8	10
40	31	8	15	12	26	8	13	4	3	3	0
50	38	8	19	4	32	0	16	0	4	5	6

11th. On return of an Insurer to Europe, either for a temporary or permanent residence, and without reference to the state of health, subject however to written notice being given at the London Office, the Premium is reduced to the English rate, corresponding with the age when the Assurance was originally effected; and in the case of participating Policies, the profits are allowed on the

English rate of Premium, whereby Indian Assurers can continue their Policies in England on *most favorable terms*. When parties assured at the Indian rates return to England, they are required to give notice in writing, of their arrival, at the office in London : and in no case will their premium be reduced to the English rates, until they next fall due, after the receipt of such written notice.

12th. Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, *on notice being given to the Agents of the Society*.

13th. Premiums are payable either annually, half-yearly, or quarterly, and on certain conditions *monthly*, and a grace of 28 days is allowed for such payments, and claims are paid, should death occur within in that period. Policies can be *revived* within three months after the premium has become due on proof of health and payment of fine, and within six months at the discretion of the Board.

14th. Policies for the whole term of life, which have been in force for the full period of five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value.

15th. Medical referees are remunerated by the Society by a fee of *Sixteen Rupees* on proposals for assurances *not under Co.'s Rs. 2,500* :— but for any less sum—the fee to be settled by the applicant.

16th. At the period of the last annual Valuation, the Assets of the Society were ascertained to be upwards £7,43,000. The amount of Policies in force about £2,200,000, and the annual Income upwards of £120,000.

Tables of Rates, Forms, and Instructions for effecting Assurances, can be obtained on application to the Secretaries in Calcutta, or to the Local Director at Allahabad, or to Messrs. J. Stowell and Co., Agra. Messrs Peake Allen and Co., Simla, Lahore, and Uniballa, Mr. G. Ludlam, Meerut, and Mr. G. W. Marshall, Delhi.

BRADDON AND CO.

CALCUTTA, No. 14, STRAND,
May, 1862.

Agents and Secretaries.

Indian Rates of the Universal Life Assurance Society.

TABLE No. 1.—CIVIL.

Annual Premium required for the Assurance of 1,000 Rs. for periods from One to Seven Years, on the Lives of Persons in the Civil Service and others not exposed to the hazards of Military and Maritime occupations *without participation* in the Profits of the Society.

Age.	One year.	Two years.	Three years.	Four years.	Five years.	Six years.	Seven years.	Age.
18	21	21	22	22	23	23	23	18
19	22	22	22	22	23	23	24	19
20	22	22	23	23	23	24	24	20
21	22	22	23	23	24	24	24	21
22	23	23	24	24	24	24	24	22
23	23	24	24	24	24	24	25	23
24	24	24	24	24	25	25	26	24
25	24	24	24	24	25	25	26	25
26	24	24	25	25	26	26	27	26
27	25	25	26	26	27	27	28	27
28	26	26	27	27	28	28	28	28
29	27	27	28	28	28	28	28	29
30	27	27	28	28	28	28	29	30
31	28	28	28	28	29	29	29	31
32	28	28	29	29	29	30	30	32
33	28	28	29	29	30	30	30	33
34	28	29	29	30	30	31	31	34
35	30	30	30	30	31	31	31	35
36	30	30	30	31	31	32	32	36
37	31	31	31	31	32	32	32	37
38	31	31	32	32	32	32	32	38
39	31	32	32	32	32	32	32	39
40	32	32	32	32	32	32	33	40
41	32	32	32	32	33	33	34	41
42	32	32	32	33	34	34	35	42
43	33	33	34	34	35	35	36	43
44	34	34	35	35	35	36	36	44
45	34	35	35	36	36	37	38	45
46	35	35	36	36	36	37	39	46
47	36	36	36	37	38	39	40	47
48	36	36	37	38	39	40	40	48
49	37	38	39	39	40	40	42	49
50	38	39	40	40	40	41	43	50
51	40	40	40	41	42	43	44	51
52	40	41	42	43	44	44	45	52
53	42	43	44	44	44	46	47	53
54	43	44	44	45	46	47	48	54
55	44	45	45	47	48	48	48	55
56	45	46	47	48	48	49	50	56
57	46	48	48	49	50	51	52	57
58	48	48	50	51	52	52	54	58
59	49	50	51	52	54	56	56	59
60	51	52	52	54	56	58	60	60
61	52	53	55	56	59	61	64	61
62	55	56	57	60	62	66	70	62
63	58	60	61	64	66	71	76	63
64	62	64	66	68	71	77	84	64
65	67	69	72	75	77	84	91	65

Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.

Table No. 1, Example.—A person aged 30, may by paying 27 Rs. secure 1,000 Rs. to his representatives, if his death should occur within one year; if within five years, by paying 28 Rs. annually, and if within seven years, by paying 29 Rs. per annum.

Indian Rates of the Universal Life Assurance Society.

TABLE No. 2—MILITARY AND NAVAL.

Annual Premiums required for the Assurance of 1,000 Rs., for periods from One to Seven years, on the Lives of Persons exposed to the hazards of Military and Maritime occupations, without participation in the Profits of the Society.

Age.	One year.	Two years.	Three years.	Four years.	Five years.	Six years.	Seven years.	Age
18	25	25	25	26	26	27	27	18
19	26	26	26	27	27	28	28	19
20	26	27	27	28	28	28	28	20
21	27	28	28	28	28	28	28	21
22	28	28	28	28	28	29	29	22
23	28	28	28	29	29	30	30	23
24	28	28	28	29	29	30	30	24
25	28	29	29	30	30	31	31	25
26	29	30	30	31	31	32	32	26
27	29	30	30	31	31	32	32	27
28	30	31	31	32	32	32	32	28
29	31	32	32	32	32	33	33	29
30	32	32	32	32	33	34	34	30
31	32	32	33	33	34	35	35	31
32	32	33	34	34	34	36	36	32
33	33	34	35	35	36	36	36	33
34	34	35	36	36	36	36	37	34
35	35	36	36	36	37	37	38	35
36	36	36	36	37	37	38	38	36
37	36	37	37	38	38	39	39	37
38	37	38	38	38	39	39	40	38
39	38	39	39	39	40	40	40	39
40	39	39	40	40	40	40	40	40
41	40	40	40	40	40	41	41	41
42	40	40	40	41	41	42	42	42
43	40	40	41	41	42	42	43	43
44	41	41	41	42	43	43	44	44
45	42	42	42	43	43	44	44	45
46	43	43	43	44	44	44	44	46
47	43	44	44	44	44	45	45	47
48	44	44	44	45	45	46	46	48
49	44	45	45	46	46	47	48	49
50	45	46	46	47	47	48	48	50
51	46	47	47	48	48	48	49	51
52	47	48	48	48	49	50	50	52
53	48	48	49	49	50	51	52	53
54	49	49	50	51	51	52	52	54
55	50	51	51	52	52	53	53	55
56	51	52	52	53	53	54	55	56
57	52	53	53	54	55	56	56	57
58	53	54	55	56	56	57	58	58
59	54	55	55	57	58	60	60	59
60	56	56	57	59	60	62	64	60
61	57	58	59	60	63	65	68	61
62	60	60	61	64	66	69	73	62
63	62	64	65	68	69	75	80	63
64	66	68	70	72	74	80	87	64
65	71	73	76	78	80	87	94	65

*** Premiums are received in half-yearly or quarterly payments for the convenience of the assured, but in case of lapse the full premium of the current year will be charged.

Table No. 2, Example.—A person aged 30, may, by paying 32 Rs. secure 1,000 Rs. to his representatives, if his death should occur within one year; it within five years by paying 35 Rs. annually, and if within seven years by paying 34 Rs. per annum.

UNIVERSAL LIFE ASSURANCE SOCIETY.

WHOLE LIFE.

Age	CIVIL.		MILITARY AND NAVAL.		ENGLISH RATES.		Age
	TABLE No. 3. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe.	TABLE No. 5. Annual Premiums required for the Assurance of 1,000 Rs. without participation in profits, but with reduction of Premium on return to Europe	TABLE No. 4. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe.	TABLE No. 6. Annual Premiums required for the Assurance of 1,000 Rs. without participation in profits, but with reduction of Premium on return to Europe.	Annual Premium for assuring £100, for the whole of life, with participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 3 and 4.	Annual Premium for assuring £100, for the whole of life, without participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 5 and 6.	
18	41	31	45	34	1 17 2	1 13 6	18
19	42	32	46	35	1 17 11	1 14 2	19
20	42	32	47	36	1 18 8	1 14 10	20
21	43	33	48	37	1 19 6	1 15 7	21
22	43	34	49	38	2 0 5	1 16 5	22
23	44	35	49	39	2 1 4	1 17 3	23
24	44	36	50	40	2 2 3	1 18 1	24
25	45	36	51	41	2 3 3	1 19 0	25
26	46	37	51	42	2 4 4	1 19 11	26
27	46	38	52	43	2 5 5	2 0 11	27
28	47	38	53	44	2 6 7	2 2 0	28
29	48	39	54	45	2 7 8	2 2 11	29
30	48	39	54	45	2 8 10	2 4 0	30
31	49	40	55	46	2 9 11	2 5 0	31
32	50	41	56	46	2 11 0	2 5 11	32
33	51	42	57	47	2 12 3	2 7 1	33
34	52	43	58	47	2 13 7	2 8 3	34
35	53	43	58	47	2 14 11	2 9 6	35
36	54	45	59	49	2 16 5	2 10 10	36
37	55	46	60	50	2 18 0	2 12 3	37
38	56	47	61	51	2 19 7	2 13 8	38
39	58	48	62	52	3 1 3	2 15 2	39
40	59	49	63	53	3 3 0	2 16 9	40
41	60	51	64	54	3 4 9	2 18 4	41
42	62	52	65	55	3 6 6	2 19 11	42
43	63	53	66	56	3 8 3	3 1 6	43
44	65	54	68	57	3 10 2	3 3 2	44
45	66	55	69	58	3 12 2	3 5 0	45
46	67	57	70	60	3 14 5	3 7 0	46
47	69	58	72	61	3 16 9	3 9 1	47
48	70	60	73	62	3 19 4	3 11 5	48
49	72	61	75	63	4 2 3	3 14 1	49
50	74	62	77	64	4 5 6	3 17 0	50
51	76	65	79	67	4 9 1	4 0 3	51
52	79	68	81	70	4 12 10	4 3 7	52
53	81	71	83	73	4 16 11	4 7 3	53
54	84	74	86	76	5 1 2	4 11 1	54
55	87	76	89	78	5 5 10	4 15 3	55
56	89	79	91	81	5 10 10	4 19 9	56
57	92	81	94	83	5 16 2	5 4 7	57
58	96	84	98	86	6 1 10	5 9 8	58
59	99	86	101	88	6 7 7	5 14 10	59
60	103	88	105	90	6 13 2	5 19 11	60
61	108	94	110	96	6 18 0	6 4 3	61
62	113	99	115	101	7 4 1	6 9 8	62
63	118	104	120	106	7 9 11	6 15 0	63
64	124	109	126	111	7 16 7	7 1 0	64
65	131	114	133	116	8 3 7	7 7 3	65

* * * Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.

In the event of the parties whose lives are Assured returning to reside in Europe, they will be reduced to the English rates from the date when their premiums first fall due after arrival, such reduction will only be allowed upon their furnishing satisfactory proof to the Directors of the exact date of their return, and their Policies must be forwarded to the Office to receive an Endorsement prohibiting their departure from Europe without the previous written consent of the Directors, and all such Assurances will be void if the parties whose lives are Assured shall go beyond the limits of Europe without the said permission shall have been first obtained, and such premium paid as in the opinion of the Managing Committee or Directors will correspond with the extra risk incurred.

Parties assured in Company's Rupees in India, who may determine on paying their future premiums in England, will be required to pay them at the fixed rate of Exchange of Two Shillings per Company's Rupee; and in the event of such assurance becoming a claim payable in England, the sum assured will be paid at the same fixed rate of Exchange of Two Shillings per Company's Rupee.

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Agricultural & Horticultural Society

OF

INDIA.

Hand Book for the Cultivation of Cotton in India. By W. BENNETT ESQ., of Ellengunge, Port Muttah.

IN a thoroughly practical 'essay' of this kind it would be useless to enter into the history of the cotton plant, a plant, which we all know, produces for the use of mankind throughout the whole world, a necessary article for his real wants, second only to food.

I therefore without further preface enter upon the subject by stating that having attentively studied the subject of cultivating cotton in the Sunderbunds, I laid my views upon the matter before Mr. F. Schiller of the house of J. Borradaile and Co. of Calcutta, and he was so impressed that these my views and plans were based upon reasonable and clear grounds that without hesitation he placed one hundred beegahs of the ordinary run of Sunderbund land on the Ellengunge estate, at Port Muttah, together with the necessary funds, at my discretion to work out the problem. It is unnecessary to state the preliminary movements in detail as they simply consisted in my visiting the estate, and upon the spot determining the rule and principle of action to be observed, and I have merely to say that from the rules then laid down I have not in the slightest degree deviated.

On the 16th of May 1861 I cut the first turf and com-

2

Drainage.

menced drainage, and I may here state that the one hundred beegahs of swamp land was laid out by me in

the following manner; seven hundred feet in breadth by about two thousand and sixty feet in length, forming a parallelogram, was enclosed on all sides by a drain five feet broad at the top, five feet deep, and sloping at the sides so as to be two feet broad at the bottom; the whole of the earth thrown up from this drain was thrown on the *outer* side so as to form a sufficiently protective bund to keep out the water from the surrounding inundated lands during the rainy season, and the bund on the river facade was strengthened so as to give no fear of salt water entering at any time.

A sluice of adequate size and strength was then placed

3

Sluices.

in position at such a depth as secures at each ebb tide the requisite fall to

draw off at pleasure all the water from the enclosed field.

The next thing, was to run a series of small drains across from side to side of the seven hundred feet; these

4

Small cross drains.

small drains are placed at sixty two feet apart, each drain is two feet broad

at top, twenty seven inches deep, and slopes at the side so as to be about one foot broad at the bottom; thus it will be observed that the land is laid out into plots or beds of about three beegahs or say one English acre each.

The land thus enclosed with suitable protective bands,

5

Cost of drainage per
beegah

and efficiently drained to meet even the requirements of the present severe rainy season, and enabling me with

success to plant and grow cotton during the rains, has cost the ~~sum~~ of four rupees and four annas per beegah or £ 1-5s 6d per English acre.

The earth thrown up from the cross drains was then scattered about the plot or bed, a little
6
Earth from cross drains more perhaps in the centres than at
how disposed of. the sides, this to prevent water from
lodging on the surface; and this is worthy of attention, as should the earth thus thrown up be suffered to remain at the sides, the centres of the plots or beds would be lower than the sides, and thus nullify what the cross drains are intended to effect.

The Estate being thus laid out, and so far as drainage
7
Cleaning the surface the next operation was to thoroughly
and tilling the land. clean the surface of all weed and jungle so as to prepare it for tillage, and if land be broken up to a depth of three or four inches it is quite sufficient, and can be done either by manual labour or by the plough.



The beds must now be lined out at the requisite distances at which you determine your
8
Lining the land at distances for planting. seed shall be planted, and a rope marked by the insertion of a piece of cloth at the distances in a manner similar as sailors mark a log line, is at once a simple and easy method to obtain uniformity, this run length wise and cross wise gives you all that is desired. My system of distances is four feet by four feet.




Every thing is now ready for planting, and it is recommended to place a man to each mark

9
Planting: on the line across the plots.

The number of seeds to each hole will of course vary as the seed may be fresh or otherwise but perhaps five seeds to a hole, as a fair average of the germinating powers of foreign seed, may prove upon the whole to be about the mark. Egyptian seed may be an exception as it reaches India so quickly by the steamers, and perhaps three of that kind may be found to be sufficient. The seeds should be sown *not deeper than one inch*, and the earth thrown most loosely over them:

the hole (if I may so call it) *is a mere scrape* to be made with the pointed end of a stick, and the labourers should be instructed not to throw the seed into the hole in a lump

together, but to place them some what thus  or thus 

  —In moderate weather the seeds will germinate 

and make their appearance in the shape of two small leaves, in five days. It will then be time to look after supplying, and in this it is desirable to use much attention, as unoccupied spaces give an unplanted and negligent appearance to a field, besides the actual loss in number of plants.

When the plants are about five inches in height it is well to commence thinning out, by carefully pulling out all in excess of two, and when these two attain about ten inches pull out the weaker plant, leaving but one for crop purposes.

In wet weather the seedlings may with much success be transplanted.

When the foliage of the cotton plant has fairly covered the ground, weeds wont trouble you much, nevertheless they should be carefully looked after and exterminated; perhaps the best plan is to bury them, let nothing but the cotton plant have possession of the land, for if weeds be permitted, they will soon do mischief, not only in retarding the growth of and choking the cotton, but it must be noted that a crop of weeds, useless as they are, take at the least, if not infinitely more nourishment from the land than a crop of cotton, and thus the land becomes the sooner impoverished; and whilst we are now commenting on what impoverishes, let me not omit to notice the good result that from year to year accrues from the resources which the drains afford; an immense quantity of decayed

12 Drains to be cleaned out annually and the stuff, consisting principally of decayed vegetable matter forms excellent manure.	vegetable matter settles gradually in the drains, and this the finest of manure,—if annually, when the drains are cleaned out, thrown about the roots of the plants, will be of itself enough to keep the land in good heart for years.
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13 Topping.	When the plant has attained the height of Four and a half feet it should be topped, and it is here to be remarked that it is by no means an economical system to permit the plants to grow to a great height, for the following reasons: 1st too much wood, by diverting the sap, does most certainly deteriorate the quantity as well as quality of the out-turn, 2nd if the trees be permitted to grow beyond the height of the shoulder of a man, then in gathering time, an immense loss is sustained, for the gatherers will have to stretch themselves to pick from the upper branches (and at that period the wood is peculiarly brittle) which must be bent down, and in such cases the branches are either much broken or partially wounded, and should the wounded branches happen to have upon them pods in an incipient state, such pods will prematurely ripen, and as a consequence the cotton obtained from them will be of an inferior description, and will seriously affect the general sample; by all means then it is most desirable to top the plants at a reasonable height.
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14 Handling.	We have now arrived at the most important point in the culture of the cotton plant, and the process about to be described must be attended to with every care and attention, as upon that process depends the success or otherwise to obtain either quantity or quality of produce; and it does seem strange and unaccountable that hitherto no one writer in India has noticed this necessary self-evident process, relating merely, that the plant grows magnificently here, or superbly there, but leaving us completely in the dark as to results in pro-
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duce, and if we put aside the bulk of the cotton grown by the natives of India, and which with but little exception is of an inferior quality, and turn to the efforts hitherto made by Europeans, all we know is that very fine samples have been produced; but twist the matter how we may what has been produced remain as samples only, and no general principle has been laid down for the guidance of persons desirous to plant cotton; except a sort of random 'speculative thought' (only indulged in); and yet India is the

15
Cotton plant revels in too much luxuriance. native country of the plant, and in India it grows every where—*only in too much luxuriance*, revelling as it were, in the full richness of the soil and climate; thus the plant subordinate to excessive profusion of wood and leaf has not the power to develope its resources in produce, either in quantity, length of staple, or strength and evenness of fibre. In fact no one

16
Cotton plant to be subdued in order to render it fully productive in India. seems to have turned his attention to *subdue* the plant, and thus render it profitable to all who may undertake its culture.

In America, in which country it is not indigenous, and where in season the plant has to bear cold even to the intensity of frost, the process I am about to describe and explain, is not needed, as the annual wintering it receives renders such process unnecessary; but in the plains of India the case is widely different, and he that neglects it must not, cannot, expect the happiest results from his labour—the process I allude to is called “Handling” in contradistinction to “Pruning,” the one operation being accomplished *without*, and the other *with* a knife.

The process of ‘handling’ requires merely the action of the fore finger and thumb, and to “handle” properly a cotton plant, is at once the nicest and most important point in its culture.

Therefore so soon as the plants are in full blossom go

carefully through your field and remove from the primaries *all the secondaries*, that may be upon them, *for at least six inches all round the stem, from the top of the plant to the crown of the root*; the object being to give to the plant a free circulation of light and air; nor is this all, for hav-

17
 A free circulation of light and air, essentially necessary for the full development of the resources of the cotton plant.
 ing cleared away all obstruction to light and air from the *centre* of your plants, it is necessary *as soon as the pods are set*, to at once remove all small and spindly branches, together with, probably, every third leaf, from the entire body of your plants—but in all this the state of the weather and the peculiarity of the season must, with all prudent men, be considered, only bearing in mind the plain matter of fact that a free circulation of air and light are as essentially necessary for the full development of the resources of plants, as they are to man.

Do not be alarmed at all these particulars for although it takes a considerable time to explain the mode and reasons for the operation, yet the work in itself is very simple, and once a labourer knows what is required of him, will handle three or four hundred plants per day—the art is soon learned; thus for example, when the planter has decided upon the extent of handling required let him take with him two of his most intelligent labourers and carefully instruct them

18
 Instructing labourers how to manage the Cotton Plant.
 in what he wishes to be done—in one day these two men will learn the mode—on the second day give a labourer to each of these two instructed men, and so on doubling four instructed men, until you are perfectly satisfied you have as many as your work requires.

The plants will not require any further treatment until
 19
 Pruning.
 after your crop is gathered, when the question will arise “shall we root up all the plants and repeat the process as already detailed, or

shall we, taking advantage of a healthy plantation of trees, save time labour, and expence, by simply pruning?"

If the latter be determined upon, and I certainly most strongly recommend it, then as soon as your crop is fairly gathered, give to each labourer a sharp pruning knife and a stick three feet long—let him cut away every thing above

20

that three feet—he must be instructed

How to prune Cotton plants. to firmly grasp the stem with one hand and with the other place the

knife *under* and make his cut *upwards*, if he makes his cut downwards then in all probability he will split and wound every thing before him.

After cutting away every thing above three feet you will then look at your stumps, as we may now not inaptly call them—it is at this stage you will study the natural history of the plant, and act accordingly, thus—the cotton plant possesses the remarkable property of reproducing its primary branches as the old ones become effete from previous crop bearing, and the planter should take advantage of this remarkable property when he prunes, by cutting away, within an inch of the stem, every old primary at the shoulder of which a new sprout may be shewing itself, this gives the new shoot full room and fair play; where however a new shoot is not observable, the branch should be pruned at about eighteen inches from the stem, and small and spindly secondaries cut away from it, but on no account cut away any new sprouts;—by careful attention to this process you

21

All the old wood is cut away from the Cotton plant.

will have a complete succession of new wood for the following season. You are now free, perfectly free of all the old bearing wood, the stump will soon vigorously send forth its new wood and then all you have to do is to repeat in proper and due time the simple processes already detailed under the heads 'Topping' and 'Handling.'

Thus you may go on successfully with the same plants
 22 for a series of years, but it perhaps
 A fourth part of the land to be annually re- planted. would be desirable, and it is therefore recommended, that *from the third year*, a fourth of your cultivation should be rooted up and the land resown, and thereafter a fourth part annually, so that in reasonable time you would have a plantation of plants, the oldest never more than three years old and a young and vigorous fourth, annually coming forward.

Pruning knives with fixed handles are the best—these
 23 are fitted in a leathern case which is
 Pruning knives and steels. carried in the girdle: be careful in the selection of your knives, and it may not be prudent to purchase a cheap kind, there can be no doubt that ‘Rodgers’ supplies about the best, and the cost of good knives should not exceed twenty-four shillings per dozen—it is well that every tenth labourer should be supplied with a good steel, and likewise each Cooly sirdar should be furnished with a steel, so that the knives may be kept perfectly sharp, as blunt knives will wound and destroy every thing that is attempted to be touched by them.

As the preparation of the cotton for market requires as
 24 much attention and care as the growing
 Gathering and prepar- ing crop for market will be treated in a separate Hand Book. of the produce, I purpose to treat that part of the subject in a separate Hand Book, and in which the four principal processes to which, (after housing,) it must now undergo, namely,—curing, ginning, cleaning and Baleing, together with all necessary information in respect to Barbecues and Tools,—machinery,—and Buildings actually required, will be duly set forth and explained—therefore for the present having freely and without reserve given to the public the result of fifteen years practical experience of growing cotton in the tropics as practised successfully and with the best results in British Guiana and in that portion of it which

constitutes Berbice, I have only now to add a few general remarks founded on a considerable amount of practical knowledge of agricultural pursuits in India; and although

25
General remarks. in this my first published 'essay' on the cultivation of cotton I feel some-

what diffident in making my acquaintance with the general public, in as much as I may be considered as having entered too much into detail, yet perhaps I may be permitted to say in vindication that in every relation of business the attention to minute details makes up in the aggregate what is called success in life, so it may be with the subject now treated on, and as this hand book is for the information of those who may not have had other opportunities to avail of, and who may be seeking for such information, then to

26
A systematic 'form' adapted for all parts of India. such parties these details may be of some service as setting forth in a systematic form, the method of rearing and managing the cotton plant: and such treatment and management of the cotton plant as set forth in this hand book, (with the exception of drainage) is as applicable to the successful development of the capabilities of the cotton plant in any part of India, as it is to the Sunderbunds.

27
Sunderbund swamps available for cotton cultivation. Having stated the method pursued on this estate to render the swampy lands of the Sunderbunds available for the cultivation of the cotton plant, all that I have now to add is to state that success has so far attended that method, and I have not the slightest doubt that should any person be desirous to witness and satisfy himself upon the point, that he has but to ask permission of Messrs Borradaile, & Co. to visit this estate, when every explanation of the system will be given on my part. In every material point I have practical evidence enough that the Sunderbunds present as fine a field for the suc-

cessful cultivation of the cotton plant as any field in the world—the land is rich even to profusion—the climate is all that the plant requires, and the general run of the soil is sufficiently yet not over impregnated with salt, and it is

28
Cotton plant thrives
best in land impregnated
with salt. a well known fact that the cotton plant thrives best under the influence of sea air; and where the soil is impregnated moderately with salt there does the plant yield the largest return as well as give the finest quality of produce.—Yet still, all this love for a salt soil is limited, for should your river bund break, and the sea water inundate your fields,

29
Effects of salt water. all the plants then on the ground would die in a few hours, but in a few months afterwards the same land would be as fully fit for cotton plants as ever it was; for example, it is not uncommon in British Guiana to let in the salt water upon a field which the planter may be desirous to replant; the sea water is allowed to remain on the field a few hours, it is then drawn off, and in the course of a few days not only all the plants, but every weed is killed—and when the dead stumps are pulled up, the surface is perfectly clean;—with the following rains the planter then merely lines out his field and replants it, and the cotton grows there again as vigorously and as well as ever.

When I first mooted the thorough conviction I entertained of this vast tract of country being in every essential suited for cotton, various were the objections made, one in particular as it was shared by many, I shall name, it was to the following effect. “How can you expect to grow cotton on the low lands of the Sunderbunds when you know that the rivers which intersect them are perfectly salt all the year round, and that the tide rises several feet above the general surface?” My reply was that it mattered not how *high* the tide rose above the general surface; the really practical

30
Objections made to Sunderbunds and replies

question should be “how low does the tide fall *below the surface* during the months of general inundation?” because a suitable bund (if properly made) would keep out the tide at any height, whilst the ebb, if the fall was anything beyond five feet would be ample, and enable me, with adequate sluices to effectually drain the land twice in every twenty four hours. *So it is*—let therefore the question of intending promoters of cotton cultivation in the Sunderbunds be simply “How low does the tide fall below the general surface of the land in the inundation months at such or such a place?”—if the reply satisfy the enquirer that the fall of the tide at such a period is between five and six feet, then may he in perfect safety, commence cotton culture there; and here I

31

may add a few words of caution
Do not drain too deep. against going too deep with your drainage—bear in mind that although you have to drain to a certain depth to protect your cultivation from the effects of heavy rainy seasons, yet it is equally as essential you should not forget that you also have to combat with, for several months in the year, a burning sun, and that if your drainage is below a reasonable depth the land will in certain months be rendered too dry, the soil will under such circumstances bake up, your cultivation will wither, and perhaps all your labour prove in vain; it is proper that such contingencies should be considered; and therefore whilst you carry your drainage works sufficiently deep enough to permit the free culture of your fields during the rainy months, let prudence ever be at your elbow to prevent your draining to any unnecessary depth.—

The tap root of the cotton plant (when the plant is
32
Depth to which tap root descends. fairly treated) penetrates, as a general rule, from sixteen to eighteen inches in depth in search of the moisture it requires, whilst the lateral roots seek their nourishment near the surface, so that it is necessary after the reaping of each crop that the

ground should be tilled, and this operation is best performed by using the four pronged Kodalics; and in carrying

33

Annual tilling and manuring with cuttings and from general prunings.

out this operation at this particular period, all the cuttings from the pruning—all the dead leaves &c &c should and ought to be buried among the

roots of the cotton plants, this not only keeps the surface of land open and free, but returns to the soil a sufficient quantity of manure matter, keeps the soil in heart, and is in fact simply what is called good husbandry.

In conclusion to this practical essay, I have only now

34

Probable extent of Sunderbund land suitable for cultivation of cotton.

to add that as the Sunderbunds proper, together with land situated inland so far as the influence of the tidal way

extends, and then adding to this, all the land on the opposite side of the Bay of Bengal, and again inland so far as the influence of the tidal way extends towards the town of Hooghly up the river of that name, will without doubt give somewhat about three Millions of square ares of land

35

Annual capabilities of Sunderbunds production of cotton.

adapted for the cultivation of the cotton plant, and which if so cultivated is capable of producing annually some three millions of bales of cotton—this

too the produce of a free people under British rule with the

36

Proximity of Calcutta to Sunderbunds.

city of Calcutta in close proximity on the one side, whilst Port Mutlah is almost in the centre of this territory,

37

Port Mutlah the centre of Sunderbunds.

—a Port situated on a river affording at all times and in all seasons a safe anchorage for the largest ships, and

approachable from the Bay of Bengal at all seasons with the most perfect safety, so that cost

38

Cost of transport from estates to Port of shipment a mere trifle.

of transport of the cotton will be a mere trifle from any part of the Sunderbunds to whichever port, either

Calcutta or Port Mutlah, the Planter may desire to send his

39
Railway from Calcutta to heart of Sunderbunds. produce; nor is this all, a Railway is in course of construction, and in fact is nearly completed, to connect Calcutta with the Port of Mutlah. And now it but requires Capital and enterprize to make this large territory into a

40
Sunderbunds a source of immense wealth to Bengal. profitable cotton field, thus creating and adding to Bengal a source of immense wealth.

WILLIAM BENNETT.

ELLENGUNGE COTTON ESTATE,

PORT MUTLAH:

Aug. 1861.

Silk cultivation at Umritsur. Copy of a letter from the Financial Commissioner, Punjab, to the Secretary to Government, Punjab, No. 307, dated 30th May 1852.

I have the honor to submit for the consideration and orders of His Honor the Lieutenant Governor, a copy of a letter dated 22nd current, addressed to me by Mr. Cope of Amritsur, soliciting aid from Government towards carrying on, at Amritsur, next year, on a larger scale than has been heretofore attempted, operations for rearing silk worms, and preparing silk.

2. I have annexed to his letter a copy of the Reports received by him from Manchester, through the Private Secretary to His Excellency the Viceroy, upon the silk which he last year raised at Amritsur. The report in question, it will be seen, is eminently favourable, and Mr. Cope considers the entire experiment of last year to have been completely successful, though on a very limited scale. This year he has been unsuccessful, owing, he considers, to the defective character of the accommodation supplied to his worms. But the success of last year; the continued success of the Cashmeeree-Jafir at no great distance from Amritsur; and

his own experience, gained during a series of experiments extending through the last ten years; have satisfied him that, if, all necessary appliances be provided, there is nothing in the climate of this part of the Punjab to prevent the profitable rearing of silk worms.

3. That this point should be definitively settled by means of an experiment conducted on a suitable scale, and with the benefit of all the knowledge he now possesses of the points to be cared for, and the mistakes to be avoided, he considers to be most desirable. With the aid of Mr. Jameson, the Superintendent of the Government Garden at Saharunpur, he has raised at Amritsur, during the past 3 or 4 years, large plantations of the *Morus multicaulis* and *Sinensis*, (the varieties of mulberry best suited for this purpose) partly on public lands and partly on his own, and very conveniently situated for the purpose; so that he is fully prepared to superintend such an experiment, with full confidence that it will succeed if no unforeseen calamity occur, and will prove conclusive as regards such points as are still doubtful. As, however, he has not, at present, the requisite capital available, he solicits the aid of Government.

4. Almost immediately after the receipt of Mr. Cope's letter, I received, very opportunely, an excellent and very interesting paper drawn up by Lieutenant Powlett, Assistant Commissioner of Gujranwala, on the operations of the Cashmeeree Jafir at Daria Pattan near the Ravi, in the Shakargurh Pargannah of Gurdaspur; which he had lately visited. This paper he forwarded to me through Captain Pollock, Deputy Commissioner of Amritsur, who has made a few remarks upon it, and I forward it herewith in original. It appears to me strongly to corroborate Mr. Cope's opinion, that if the worms be treated with judgment, by a man who understands their habits and their wants, and sufficiently supplied with suitable food, they can endure heat and dryness without injury.

5. I entirely concur with Mr. Cope in the belief that the carrying out of such an experiment as he contemplates is most desirable at the present time. The operations and efforts of the past few years have paved the way for it, the causes of failure have become more or less apparent, plantations suitable for the purpose have been prepared;—and we have in Mr. Cope, a gentleman who is peculiarly qualified for superintending it, both from the experience which he has gained, and from the enthusiasm with which he regards it. Had he the means at command for supplying all that is needed, he would gladly himself embark in it independently, as a speculation which he is confident will prove remunerative; and he applies to Government only because its aid is just now necessary to him for this purpose.

6. I venture to hope that this aid may be afforded him, in such mode as may be deemed most suitable; and the advance to the Indian Flax Association of Belfast, recently authorized by the Secretary of State for India, encourages me to believe that an undertaking so similar in character may be deemed worthy of some substantial support. It will be seen that if the temporary use of one of the walls of the Rambagh be granted, as a lean-to, and the trimming of the road-side mulberry trees be allowed, to both of which the local Committee readily consent, Mr. Cope roughly estimates that the entire outlay will be rupees 3,000; and if rupees 2,000 be granted by Government, I have no doubt that he will be enabled to set the undertaking on foot, and will, at the same time, bind himself to repay, in the event of its being successful, such portion of this as Government may think fit to prescribe.

7. The silk produced by Jafir this year, (of which a specimen accompanies this) is valued on the spot at 16 or 17 rupees per seer of 98 tolas; while Mr. Cope's has been valued at 25 shillings per lb, or 25 rupees per seer, in England which shows how great a difference in value results from

superior reeling. The quality appears to be quite equal to that imported from the westward, and the main difficulty which Jafir has experienced, is in preserving the eggs, for which a cool temperature is indispensable. This object he secures by keeping them in a very deep Taikhanah or underground room at Majithia of Amritsur, while Mr. Cope purposes attaining the same end by sending them up to Dhurmsala. In the hope of operations being undertaken at Amritsur next season, he has secured from Jafir 10 seers of eggs at 20 rupees per seer.

8. In a separate letter which I have received from Mr. Cope, he informs me that besides the Cashmeeree Jafir Ally, who has for many years devoted his entire energies to silk rearing, 5 other natives have this year raised silk in the Amritsur and Gurdaspur districts. The entire quantity produced by them he estimates at about 50 seers, besides refuse; valued in all at about 800 rupees. It is clear, therefore, that what has heretofore been done, has already acted as a stimulus, and there is every reason to believe, that if an experiment on a larger scale be now judiciously conducted, under Government auspices, the occupation will greatly extend, and an important additional means be thus afforded to our populations of earning a livelihood, or increasing their income, by rearing silk worms, or growing mulberry trees for their support.

Copy of a letter dated 22nd May 1862, from Henry Cope, Esquire, Amritsur, to the Financial Commissioner for the Punjab.

Permit me to draw your attention to the advantage that would accrue from the intiation, by the State, should you see fit to recommend it to His Honor the Lieutenant Governor, of a more extensive operation in the cultivation of silk than has yet been undertaken, with the exception of the one at Lahore in 1855, the causes of the failure of which

have been already explained by me, arising from shortness of food and unsuitable accommodation, exposed, as the worms were, to the vicissitudes of temperature more varying in March and April than almost any other season.

All that has been done at Amritsur has been done at my expence, with the exception of a comparatively small outlay this year by the Local Committee in the erection of a grass shed. I have already had the honor to submit the opinion of the Chamber of Manchester on the proceses of my large operations of 1860, which thoroughly satisfied me that silk can be produced to advantage in the plains of the Punjab. It is true much of the excellence of the silk then produced (the quantity was over *three and half maunds* of cocoons) is owing to the fine reeling of Mr. Turnbull, but if the elements of a first rate fibre were not at hand no reeling could make good out of bad silk.

The chief requirements to the successful rearing of the silk worm are food of a good kind and in abundance, and suitable accommodation. The former is now available at Amritsur. In the public garden there are 500 well grown foreign mulberry plants, 18,000 of from six to ten feet high, and about 1,00,000 plants which in March next year will be six to eight feet high,—yielding an abundance of leaves. There are about 1,000 country plants well grown, and a large number of trees alongside the roads (Grand Trunk and station) which judiciously trimmed would afford a large amount of food without suffering any damage. I enclose a note from Captain Pollock on the subject of trimming. I have seven beegas of land thickly planted, the produce of which I should be happy to make available for the year 1863, and if it should be necessary to purchase, there are abundance of trees in private gardens, the leaves of which the owners would sell; and finally I should be happy to give my small services for superintendence, of course free of all remuneration.

The great desideratum is a suitable tenement sufficiently good to protect the worms from alterations of temperature, and it has occurred to me that such might be provided cheaply by using one of the existing pukka walls of the Rambagh temporarily as a lean-to. I am authorized by the Deputy Commissioner and Local Committee to say they have no objection to its use as such, and all that would be required would be a second wall and a roof, both of which might be of the cheapest kind. Mr. Gordon, Civil Engineer, tells me that a kucha wall might be erected for 3-8 per 100 cubic feet ; and that a roof, such as would be required, would cost 10 Rs. per 100 superficial feet. The length of the wall I would propose using, is 575 feet. A kucha wall 13 feet high and 2 feet thick would cost 525 Rupees, and the roof, allowing an inner breadth of 14 feet to the edifice would be Rs. 1,035. It would further be necessary to fit up this building suitably by preparing racks in 5 tiers on both sides ; for these, Bullies (upright) would be required. Say eleven score, to cost 110 Rs.; Bamboos, horizontal about 2,200 at 7 to 8 Rupees. Thus much would be required for capital outlay. For current expenses there would be superintendence (I should endeavour to obtain the services Jaffer Ali of Gurudaspur, say for 3 months at 25 Rupees ; 4 mates at 7, 6, and 5 Rupees for the same time ; and 50 laborers for collecting leaves at 4 rupees for 2 months, say 200 rupees ; for possible purchase of leaves, preparing Cocoons when rigid, 100 rupees ; and a balance for contingencies of all kinds.

To meet this current expence, seventy seers of silk only at Umritsur rates would be required ; but if the operation be only moderately successful, the yield should be much larger, and if *entirely* so, the out-turn, reeled in Bengal, and deducting all expenses of carriage, reeling, &c., should be rupees 2,500, a comparatively small sum when the final end in view is considered, viz., the proof of the suitability of

the plains of the Punjab to the rearing of silk. I have now been labouring *ten years* to prove this ; I have done much by money, in example, and by writing, towards establishing the fact, and I may, I hope, not be considered unreasonable in asking assistance for a final operation, with a defined expenditure, that shall convince all interested that my theory is practically correct.

Copy of Memorandum by Lieutenant P. W. Powlett, Assistant Commissioner, Goojranwalla, dated 10th May, 1862.

Conformably with Mr. Mcleod's wishes I proceed to give as good an account as I can of Jaffir's Silk raising establishment at Durreah Pattun in Goordaspoor, which I visited in order to get some hints on the subject of silk culture in the plains.

On my way to Durreah Pattun, I ascertained that considerable interest is felt by the neighbourhood in Jaffir's proceedings, increased no doubt by the jealousy he displays lest any one unconnected with himself should attempt silk cultivation which he would fain keep as a monopoly in his own family. I was told that many would be glad of eggs, but Jaffir had refused to part with any, and indeed would allow no one near his worms, not even his own son ! His objection to allow any one to approach the worms does not arise so much from jealousy as from a superstitious fear of the evil eye, to which, fatal sickness among silkworms is, I believe, attributed all over Asia.* Jaffir told me that English gentlemen were alone permitted to see them.

On my reaching Durreah Pattun, the first thing Jaffir in-

* NOTE.—The same prejudice exists on the part of the men (usually of the bearer or kahar caste) who tend the Tassar or wild silk. From the time when the worms are hatched and placed upon the trees in the forest, which they have previously prepared for their reception, they would mark carefully that nothing from without may come near them, keeping themselves at the same time most punctiliously apart from all that might render them ceremonially impure.

insisted on shewing me was the medal obtained for him by Mr. Cope, from the Agri-Horticultural Society. He carries it about him, and seems not a little proud of it. He told me that he had been established at Durreah Pattun some 20 years, and that he originally learnt silk rearing at Peshawur, where formerly valuable silk was raised; there were two establishments for the purpose when he was there.

I particularly questioned him regarding his stock of eggs, and measures for preserving them during the heat, as I was anxious to ascertain whether there was any trace of deterioration in the worms from plain raised eggs, or whether renewal from the hills was beneficial. He assured me that, so far from deteriorating, acclimatised eggs were far better than hill raised, as the latter produced in the plains sickly worms, many of which died in skin casting, and on his commencing business he found it necessary to procure eggs from Peshawur, as the Cashmere stock he had was unprofitable, and ever since, that is for 20 years and upwards, he has raised his own eggs, keeping them during the hot weather in a "takhhanah" at Majeetha in the Umritsur district. This method of preserving them is not, however satisfactory, as from a fourth to a third is always destroyed by the heat. Jaffir shewed me a quantity so destroyed, for the most part the heat had dried up the eggs, without hatching the worms. Those that survive the heat are not injured, but produce as healthy and fine worms as if the eggs had been kept in a cool climate; this the state of Jaffir's own worms clearly demonstrated, but it will undoubtedly be a great advantage to establish, (when silk cultivation has extended itself) a depot in the hills, where eggs may be kept during the hot weather. The carriage backward and forward would probably not cost 2 annas a seer, whereas the loss by keeping them in "takhhanahs" in the plains is (reckoning their value at 16 rupees a seer) 4 or 5 rupees a seer. Out of takhhanahs, the eggs cannot be preserved in the plains at all.

None of Jaffir's worms had commenced spinning when I saw them, (April 7th); they were of various ages, some would begin in 4 days, some in 6, some not for 10, 12, or even 15 days; these last three sets were not of much value.

As I was under the impression that the silk worm was very delicate, I was much surprised to find Jaffir's, though under such poor shelter and so crowded, looking so fine and well. Two old pauls and 5 or 6 sheds, both very low, and the latter ill ventilated, contain the whole of his stock. A hovel 30 feet, and scarcely high enough to allow a man to stand upright, held sufficient to produce 3 seers of silk: there was nothing to keep them off the ground beyond the accumulation of mulberry branches, which were removed but once in 8 days; they occupied the whole of the ground of the shed with exception of a passage $1\frac{1}{2}$ feet wide down the centre. In the pauls the worms lay as in the sheds; there was nothing beyond a single fly to keep out the rays of the sun, for such trees as there were near the pauls gave little shade. The worms nevertheless looked as well as could be wished. Jaffir said he certainly should be glad to give his worms change of air and position oftener than he could afford to do with the space at his command, but he laughed at any elaborate sanatory arrangements, and said it would never do for any but amateurs to adopt them.

In answer to my queries about the value of the silk he produced, Jaffir told me that last year he sold it at Rs. 15-8 a seer, and this seemed the average rate. As I happen to have made notes of the value at Peshawur of the different descriptions of imported silk, I can assert that the above is a higher price than is there obtained for the common Kokan, Bokhara, and Khulm silk, and within a few annas of the value of that called "lab-i-abée" which is raised on the banks of the Oxus, where the best central Asian silk is I believe produced. Jaffir himself admitted that his profits were amply remunerative and the impression in the vicinity is,

that he is wealthy, and that too in the face of considerable disadvantages. The greater portion of his mulberry leaves have to be brought 2 or 3 kos from the villages round, and as he has no trees of his own he is at the mercy of the villagers, who of course endeavour to get as much as possible for their leaves. He was complaining bitterly of the owners of some 4 kos off, for unconscionably raising the price of leaves and thus depriving him of the supply, which he had always had until the present year. In addition to the price of the leaves, he has of course to pay for their conveyance, which costs no inconsiderable sum as he is obliged to employ 12 men for the purpose. His out-turn averages 20 seers a year, and to supply his worms he requires 600 small mulberry trees. He has lately taken 5 acres of land on lease and planted some 1,500 trees on it, and is making a well. He is trying the Chinese and Philippine mulberry having procured a number of cuttings from Mr. Cope of Umritsur.

Jaffir informed me that a seer of good seed (eggs) should produce 21 seers of silk, or if the silk is sacrificed the same weight of eggs; for it is said that the amount of seed produced by a given number of worms is equal to the amount of silk which would be yielded by an equal number, and this the price of seed (16 Rs. a seer) in Cashmere bears out. The amount of silk that a certain number of Cocoons will yield varies very much. Jaffir told me he had sometimes got 2 seers of silk out of 11 seers of (dried) Cocoons, sometimes not 1 seer; the best Cocoons should yield 1 seer for 5. He knew nothing of cross breeding, never having tried it. He raises silk but once a year. I believe it is possible to have a second crop, but Jaffir said that it could never pay, as the leaves lose their nourishing properties in the heats of summer; he seemed to think too the young tender leaves were necessary for the young worms. I should think Jaffir was right on this point with reference to silk culture in the dry

plains, though in the hills it may be different. He feeds his worms morning and evening. The leaves should be as fresh as possible, but are dangerous if given wet.

Jaffir winds his own silk; he said that he could wind 4 seers a month working up to 12 o'clock in the day, which over a fire in the hot weather is as much as he can comfortably manage. If hard put to it he could wind 6 seers a month. When winding, 3 assistants are necessary to keep up the fire, &c. The dry branches of the mulberries from which the leaves have been stripped, are sufficient to keep the pot that holds the Cocoons boiling, so he is put to no further expense for firewood. The Cocoons from which moths have been produced are worth 2 Rs. a seer, being many times lighter than Cocoons containing chrysalises. The latter Cocoons when dried vary in value from 8 annas to 1 Rupee a seer.

Jaffir's success convinces me that there is no real obstacle to the unlimited extension of silk cultivation in the plains. The difficulties that have deterred the people are probably, 1st, the necessity of investing a little capital at commencement; 2ndly, the want of immediate success that attends attempts with unacclimated seed; 3rdly, the utter ruin that the destruction of the mulberry trees entails, and this in the time of the Sikhs was pretty sure to occur whenever troops passed near them.

In districts where mulberry trees are plentiful (as in Peshawur, where silk culture was re-introduced 3 years ago by Captain Graham, and is now I believe promising well) but little encouragement will most likely be necessary. The plains on the salt range at Choya Sydan Shah* and elsewhere

* NOTE.—The arable lands on the Salt range are situated in valleys of very considerable elevation and great beauty, enjoying a climate very much milder than that of the plains and exceedingly salubrious. Choya Sadan Shah is situated in one of these valleys, which possesses an abundant supply of running water, and, in consequence, most luxuriant vegetation; but this is by no

are celebrated for their mulberry trees, where they have the advantage of being watered by perennial streams, and possibly such places would be very suitable for extensive farms. In other districts the plan which is now being tried at Goojranwalla* would probably be successful, viz., a mulberry plantation will be established at the Sudder station sufficiently large to make it worth the while of an experienced Cashmere silk raiser to settle there and take charge of it. The plantation will soon become profitable to Government, and repay any advances that at first may be necessary for seed and sheds; the villages round will be encouraged to plant mulberry trees and keep worms, the management of which is simple enough, and the Cashmeree would gladly purchase the Cocoons from them at very remunerative rates.

The situation of the manufactory at the sudder station would render it easy to introduce improvements in the rearing and winding of the silk, as information on the subject was collected.

I am aware that much that I have mentioned has been before stated by Mr. Cope, whose pamphlet on silk cultivation first gave me an interest in the matter, but perhaps information received from a successful silk raiser may be not at the present uninteresting, although it is for the most part but repetition.

Copy of a letter from the Secretary to Government, Punjab, to the Financial Commissioner, Punjab, No. 469, dated. 20th June 1862.

I have received and laid before the Hon'ble the Lient. Governor your letter No. 307, 30th ultimo, and its several means generally the case, a want of water being seriously felt in most parts.

D. F. McL.

* As Lieutenant Powlett is himself now stationed at Goojranwalla, where the Deputy Commissioner, Mr. A. Brandreth, will afford him every encouragement and aid in such an undertaking, it will have an excellent chance of success.

D. F. McL.

enclosures, regarding the experimental silk operations in the plains of the Punjab; and in reply I am to state as follows:—

2. His Honor has perused these papers with much interest; and, though by no means sanguine that the climate of Umritsur will be found to answer so well for the rearing of worms as the country further north, along the base of the hills from Holta to Peshawur, is yet desirous of giving Mr. Cope a fair opportunity of carrying out, on a larger scale than heretofore, the experiment which he has so long been interesting himself in, and which, if successful, will prove of so much commercial and industrial importance to the province. The Lieut. Governor accordingly sanctions the proposals in your 6th para: viz. that the walls of the Rambagh be temporarily granted as a lean-to for the sheds required for shelter of the worms; that the trimming of the mulberry trees on the road sides be allowed; and that a grant of 2,000 Rupees from the Government be given to Mr. Cope, in aid of his undertaking; to which His Honor wishes every success. The local residents appear to take great interest in it, and His Honor would be very glad if you would yourself see that every reasonable and necessary aid is given to Mr. Cope.

3. The account given by Lieut. Powlett of the silk operations of the Cashmeree Jaffir, is most interesting. His Honor does not wish that Jaffir should be called away to assist in the Umritsur experiment. He should rather be encouraged to carry on as before, by himself; and with this view, His Honor authorizes a sum of 500 Rupees being presented to him, to reward him for his past exertions and to enable him to extend his operations. It is desirable that Lieut. Powlett should himself convey this reward to Jaffir and explain its object to him. Lieut. Powlett is entitled to the thanks of Government for his interesting paper.

4. It is of great importance that Jaffir and others who

follow his example should meet with every encouragement from the local authorities—and that the cultivation of the mulberry should be extended. If then, with this object in view, you think it proper to make any proposals for remitting the revenue on lands planted with mulberries, bona fide, for the purpose of feeding silk worms, His Honor will be prepared to consider them favourably and to sanction the bestowal annually of Khilluts to those who undertake to rear worms and are successful.

5. His Honor desires you will be so good as to obtain further information in respect to the silk operations at Peshawar, and supply a special report on the success at that place. Further, His Honor would be glad to receive annually a report on the progress of silk operations throughout the Punjab. This might conveniently be included in your Annual Revenue Report.

*Notes on Tea Cultivation in Assam, by A. C. CAMPBELL ESQ.
Extra Assistant Commissioner, Burpettah.*

In Tea speculation, as in every other undertaking, the most important feature which presents itself is the financial department, and as no one should risk himself in the wilds of Assam or any other Tea growing locality with a view of becoming a planter without first well considering the balance standing to his credit in his private account, in connection with this he should also think of his habits of life, the comforts which he considers essential to its prolongation and the inconveniences which it may safely encounter.

The occupation of a Tea planter is that of a gentleman, and to be successful, he must at no time forget the responsibility of his position; he will thereby be able to keep his establishment in order, be respected in the neighbourhood of his estate, and be looked up to for protection by the native population in his vicinity.

In order to secure a gentlemanly independence a capital of Rupees 30,000 or 3,000 £ would be ample. Strict economy would however be required and the amount, I have mentioned, would be exhausted in a single year by bad management, a partiality to dog carts and diseased elephants, and a tendency to appear the great man before a few wondering savages.

Having attended to the above preliminary remarks the next chief point to be decided is selection of an eligible site for a factory; this requires great care and caution or else energy, capital, and time may all be wasted; proximity to a large river and to villages which may be drawn on for local labour are considered great advantages, but in my opinion these are secondary in comparison to having a good soil to work on; it does not matter so much if labour has to be imported, or carriage to be paid for, if the yield can be made to pay the additional expense of these and leave a handsome surplus. The most favourable sort of earth for tea planting is of a loose snuff coloured appearance, with a substratum at about 18 inches or 2 feet below the surface of a reddish unctuous soil interspersed with streaks resembling iron ore. This is the sort of soil on which the indigenous plant has mostly been discovered, and, I have no doubt, is the most favourable for its growth, but the selection of an advantageous site for a factory is only difficult in untried localities. In upper Assam the country seems expressly intended for Tea; all along the south bank of the Berhampooter from the mouth of the Dhonsire River to Suddya, tracts of high forest land may be met with at easy distances, most eligible for its cultivation. A planter intending to start in upper Assam should go up about the middle of the rains, say July or August; he would by visiting different factories pick up a little in regard to the management of Coolies, manufacturing &c: he would besides be able to arrange for a supply of seed and make inquiries as to the proximity of eligible land; he should also

look about for a good elephant and a pony and be ready to take the field by the middle of September, and fix on his grant. It is perfect folly taking up large grants : about eight hundred acres in one plot is about as much good land as can be got in a patch, and low Soomnee or Dullunce land can never be turned to any use. Having secured a grant of say 800 Pooras, the first care of the Planter should be to go over it thoroughly and select the very highest spot in it to commence operations upon, let him clean and cut down the forest, to the extent of 10 Pooras, and then lose no time in having a small house erected, 20 feet by 30, and on a raised Bamboo Chang $3\frac{1}{2}$ feet high. This ought to be quite sufficient to accommodate him and his traps, and he will find this physical exertion a source of great help to him in his future operations, for being on the spot he is able to get twice as much work done and far more speedily and efficiently than if he were absent and trusting native mohurcers. Being located on the land by about the end of November, the Planter should push on clearances, and by means of local and regular labour try and get 50 pooras cleared the first year. He should not however delay his planting till all his clearances are effected but divide his men so that one portion would be preparing the land for staking whilst the other continued felling the underwood and forest. He should always bear in mind that it is a great desideratum to have the seed in the earth as soon after it is plucked as he can possibly manage. As a rule he will find the young plants from seed planted before the middle of January get up healthy seedlings and a very small percentage of the seed will turn out bad, whilst it is a well known fact that seeds planted towards the end of the season even in good soil, get up very irregularly, the plants are dwarfish and sickly and take years to recover themselves. I am myself of opinion they never become such bushy, healthy plants as those sown early in the season. In regard to the process of staking I may observe

that, as it has to be done only once in a life time, and if done properly serves to give the garden a very neat appearance, a little taste and judgment would not be wasted at the beginning. The rows should by all means be made as regular as possible, and if at the same time some simple plan were adopted to work off each Poora, or plot of 5 Pooras, the expedient would prove a great help in the future cultivation of the land.

The distance the plants should be from each other has always been a question variously answered. It has been agreed however that the China plants should be planted closer to each other than the Assam, owing to the latter variety when at maturity proving a larger bush than the former. I think that 3 feet by 6 for China, and 6 feet by 6 for Assam, would be a very eligible distance; in staking however I would recommend 3 feet by 3, for the one kind and 3 feet by 6, for the larger species. This would be just double what the actual proximity should be, but in case crickets, (the formidable *Osiringa*) caterpillars, bad seed, or other causes, occasioned a loss of plants one line might be taken up to fill vacancies; and if after the 2nd year any plants remained in the extra line, they might be removed to fresh clearance, and the garden would be planted out as originally designed. Of course nurseries might obviate the necessity of these extra lines but I would prefer the latter for several reasons: 1st I would save the labour required to form and keep clear nurseries: 2nd. the plants of nurseries are generally sickly owing to being laid out so close; again a great number of them are lost in being weeded. Extra lines would provide for every possible contingency in the shape of loss of plants &c.: when required to be transplanted they would suffer very slightly, having to be removed only a few paces, as each line would have its nursery by its side. It would be very desirable to have clearances finished by the end of March, for about this time local labour be-

comes scarce and there is besides hardly any good in planting out seed so late. We will suppose that a clearance of 50 Pooras has been effected, all well planted, 25 coolies will at the very least be required to keep this extent of land free from jungles during the rains, and (at the usual rate of 1 cottah per man daily and making allowances for non-attendance) will admit of a hoeing every 6 weeks. This will hardly be found sufficient during some months but a good manager should induce his men to work double hazras in this season, and he might be able to give his plants a hoeing every month during the rains; for in light land I have seen a good workman hoe 3 cottahs or Hazras in one day and any opium eater may do 2 Hazras. If the jungles however get up above a certain height the workmen are impeded in the use of their hoes &c. It is utterly impossible sometimes to get through even a cottah. I may here observe that a cottah is the 20th part of a Poora, and hazra is a word of factory coinage used to denote a day's work; it is derived from the Hindoostany work Hazir (present) and got into its present use from a day's pay, being given to each man who was reported "present" at the end of the day; subsequently when a stated amount of work was required to entitle a cooly to a day's pay, it was found convenient for the system of monthly accounts to lose sight of the actual time occupied by the workman but to score him as "present" each time he completed the work required for a day's labor; it sometimes so happens therefore that a cooly draws 60 or 70 day's pay or more in one month, another perhaps, and who is less industrious, draws 10 or 15 days only, whilst in case of sickness they draw nothing whatsoever as a right, though in particular cases according to the temper of the manager a special allowance may be made.

Getting acquainted with, and working out this system, will amply engage the new planter's time during the rains, and he should be making preparation again to commence

clearance immediately after the end of August: he should exert all the energy he is master of to put down with seed 100 Pooras before the cold season expires: he should also collect material for building as he will now require a permanent structure for a residence: he should likewise prepare his Tea house and Godown, and arrange for a supply of about 75 additional hands; and as I would not recommend any further extensions for the present, he might, *in the succeeding cold weather*, devote all his time to laying out roads, building, sinking wells, &c.; he should also indent for sheet lead, brass sieves, and Iron pans, set up a saw pit, make up the required kind of Bamboo baskets and sieves for manufacturing, also furnaces and drying stoves; he should likewise contract for or make a few hundred maunds of Charcoal and lay up a store of fire wood, in short prepare for manufacturing. By the middle of March he will have 100 Pooras of 1 year old plants going on their 2nd, and 50 Pooras of 2 years old going on their third year. From these last he may, the preceding year, just to keep them from straggling, have made about 10 maunds of tea by nipping off the tops; in the 3rd year however he should make 50 seers per Poorah without hard plucking, and the hundred Poorahs of 1 year old seedlings should by nipping of tops yield about 1 maund of made tea for every 5 Pooras of land. In the 4th year the out-turn should be 3 maunds per Poorah on the 50 Pooras sown the 1st year, and 50 seers per Poorah on the 100 Pooras planted the 2nd year; and in the 5th year the produce should be 4 maunds on 50, and 3 maunds on 100, Pooras: in the 6th year the out-turn will be equal on both patches, and probably a slight increase of say $\frac{1}{2}$ a maund per Poorah on the older patch, but here we will stop for the present in order to enquire into the receipt and disbursement portion of the undertaking.

**1st. Year's expenses commencing 1st October and ensuing
31st September.**

Purchase of grant in fee simple, 800 pooras, at Rupees 2-8 per Poora.*	2,000
Surveying and mapping ditto,	150
Purchase of a sizeable Elephant fit for Guddy or Howda work,	1,200
Purchase of a pony,	200
Purchase of 25 mds seed @ Rs. 40 per md., ..	1,000
Clearing staking and planting 50 Pooras forest and light brushwood land @ Rs. 30 per Poorah, ..	1,500
Establishment, including one mohurer Rs. 16, two Burkundas Rs. 10, Elephant keeper 14, Horse keep- er 8; round number, Rs. 50 per mensem for 12 months,	600
Proprietor's house expenses or manager's salary Rs. 150 per mensem,	1,800
Hoeing 50 Pooras of land 4 times from April to October,	600
Miscellaneous works, building &c.,	200
Hoes axes <i>daws casus</i> &c.,	500
Total ..	9,750

2nd Year.

Seed 50 manuds @ Rs. 40 per maunds,	2,000
Clearing staking and planting 100 Pooras @ Rs. 30 per Poora,	3,000
Miscellaneous work, building &c.	200
Hoeing 50 pooras of land twice, during cold weather @ Rs. 3 per poora,	300
Hoeing 150 pooras 4 times @ Rs. 3 per poora, ..	1,800

* A Poorah is equal to 1½ Acre. S. H. R. Actg. Sec. A. H. S.

Manufacturing, sorting, and packing 10 maunds of				
Tea at Rs. 10 per maund,	..	..	..	100
Establishment @ 50 per mensem	..	..	..	600
Proprietor's expenses ..	..	..	..	1,800
Miscellaneous purchases,	..	..	..	200
Total				10,000

3rd Year.*

Building road making and other Charges,	1,000
Bamboo baskets for manufacturing, brass sieves and miscellaneous expenses,	500
Hoeing 150 pooras 6 times @ Rs. 3 per pooras, ..	2,700
Management, or house expences, 12 months, ..	1,800
Establishment 12 months,	600
Manufacturing, sorting, and packing 80 maunds of Tea @ Rs. 10	800
Total,	7,400

4th Year.

Building, road making, and miscellaneous work,	..	1,000
Hoeing 150 pooras 6 times @ Rs. 3 per pooras,	..	2,700
Management or house expenses,	..	1,800
Manufacturing, sorting, and packing 275 maunds of		
Tea @ Rs. 10 per maund,	..	2,750
Establishment Rs. 60 per mensem,	..	720
Picking and packing 50 maunds Tea seed @ Rs. 2-8 per maund,	..	125
Total		9,095

5th Year.

Building, road making &c.	..	500
Miscellaneous purchases,	..	500

Hoeing 150 pooras of land 6 times @ Rs. 3 per ..	
poora,	2,700
Manufacturing sorting and packing 500 maunds of	
Tea @ Rs. 10 per maund,.. .. .	5,000
Establishment @ Rs. 60 per mensem,	720
Picking and packing 100 maunds seed @ Rs. 2-8	
per maund,	250
Management,	1,800
<hr/>	
Total ..	11,470

6th Year.

Building road making and miscellaneous expenses,..	1,000
Hoeing 150 pooras 6 times @ Rs. 3 per poora, ..	2,700
Manufacturing, sorting, and packing, 600 mds. Tea	
@ Rs. 10 per md.	6,000
Establishment,	720
Picking and packing 300 mds. seed @ Rs. 2-8 per	
md.	753
Management,	1,800
<hr/>	
Total ..	12,970

Account of Receipts and Disbursements from commencement of undertaking to end of 6th year.

Expenses as detailed above 1st year		9,750	By sale of 10 maunds of Tea made in the 2nd year @ Rupees 60 per maund ..	600
Do.	Do.	10,000	" of 80 maunds of Tea made in the 3rd year @ Rupees 60 per maund ..	4,800
Do.	Do.	7,400	" of 275 maunds of Tea made in the 4th year @ Rupees 60 per maund ..	16,500
Do.	Do.	9095	" of 50 maunds of Tea seed plucked in the 4th year @ Rupees 40 per maund ..	2,000
Do.	Do.	11,470	" of 300 maunds of Tea made in the 5th year @ Rupees 60 per maund ..	30,000
Do.	Do.	12,970	" of 100 maunds seed plucked in the 5th year @ Rupees 40 per maund ..	4,000
			" of 600 maunds of Tea made in the 6th year @ Rupees 60 per maund ..	36,000
			" of 300 maunds of Tea seed plucked in the 6th year @ Rupees ..	12,000
			Total Receipts ..	1,05,900
			Total Expenditure ..	60,685
Total ..		60,685	Balance to credit of account exclusive of Value of Factory	45,215

It will be seen that the Factory at the end of the 6th year will require about Rupees 13,000 per annum for efficient working, and the value of annual product in manufactured Tea and seed would be Rupees 48,000, without taking into consideration that good Tea land can be made to yield as high as 7 maunds Per Poorah. The annual income would not be under 35,000 Rs. which at 10 per cent the Indian rate of interest would make the value of the concern about 3½ lacs of Rupees

The above figures will probably be considered as giving a very flattering idea of the operations of 6 years and the lucrativeness of Tea speculation, but I cannot on going over them again find any fault with their correctness. I have not however taken into consideration extreme cases; for instance when I estimate Rs. 30 per Poorah for clearances I only make an allowance for average Forest and jungle land. A planter may some time come across Forest land of a kind which would baffle all his endeavour, to make into a neat clearance; from 5 to 20 Rs. might be wasted in the removal of a single Tree with its stump; blocks when levelled with surrounding soil may make the garden look better; all these little bits of engineering require money; they are besides exceptional cases and they depend chiefly on the taste of the manager; no rule can be made in regard to them.

In hoeing I have estimated the rate of pay to coolies @ Rs. 4-8 per mensem, which notwithstanding the cry for labour I am persuaded will continue to be the level for several years to come; for manufacturing sorting and packing I have estimated Rupees 10, this will allow of Rs. 4 for plucking, 1-8 for manufacturing, 2 Rs. for sheet lead and solder, 1 Rupee for Box and nails, 1 R. for sorting and packing, and 8 as for contingencies.

I must again say I have made no allowances for exceptional cases—in regard to wooden Boxes especially I have seen Rs. 2-8 given for a common 1 maund chest, and as high

as 1-4 for the *making* of one alone, wood, nails, and implements being supplied from the factory. I have also seen Boxes equally as good in which the making, nails, wood, and every other expense have amounted only to 9 annas and 6 Pie, and when we consider a little foresight can always supply a planter with abundance of wood and experienced labor at cheap rates the extravagance of high prices is necessitated chiefly by carelessness in not securing a stock, instead of at the last hour giving any price to preserve the teas from spoiling.

In the item for management I have supposed the case to be that of an energetic gentleman who has a small capital available and is anxious to do the best he can with it, elects tea planting and superintends it himself. He will find Rs. 150 per mensem ample for his private wants: House room and conveyance are obtained from the factory, and his expenses consist of 2 or 3 house servants, bazar articles, and a few stores from Calcutta, among which beer should by all means hold the most conspicuous place. Imbued in moderation it is an invigorating and grateful beverage, and admirably adapted for life in the back wood. Taken with a few pinches of quinine, I may in passing observe it is a specific for warding off all febrile symptoms consequent on exposure to sun, rain, or malaria. In cases where an experienced manager is required who is to depend only on his wages as his prospects, a salary commencing @ Rs. 250 per mensem and rising gradually to 500 with or without commission would I think be about an adequate consideration.

I have not admitted the expense of sending Teas to England, for I am of opinion that if Tea is properly made the average price should be Rs 60 per maund free of every expense including home charges, brokerage, &c. incurred from date of shipping on board inland steamers.

There are other minor items which I think require a little elucidation and I will revert to the subject hereafter should

I have leisure ; but I think I have stated enough to show that Tea planting is an eligible investment for capital ; it is besides a clean and gentlemanly occupation and would probably be very extensively engaged in by all classes of the European community if its prospects were better known.

NALBARRY :

6th July, 1862.

Report on the productive resources of the Sasseram District.

By R. W. BINGHAM ESQR. Chynepore.

[The following Report was prepared by Mr. Bingham at the request of the Central Committee of the Exhibition of 1862. The original intention of the Committee was to obtain similar Reports from all parts of India for publication with the official catalogue of the works of Art and Industry for the great Exhibition, but so much delay occurred in collecting the Reports from other quarters, that this design was not carried out ; and accordingly Mr. Bingham obligingly placed the following at the disposal of the Agricultural and Horticultural Society. ED.]—

SECTION I.

Mineral Ores.

1. The portion of the Vyndhya hills forming the Southern portion of Shahabad, and of Mirzapore North and North west of the Soane river, together with Mirzapore South of the Soane, *Rewah* Palamoo, and in fact, the whole chain and spurs of the Vyndhya Range in this neighbourhood, is full of mineral wealth of various kinds, and will doubtless in the course of a few years, (when Railways run down the valley of the Soane connecting the Gangotic valley with the valley of the Nerbuddah,) be found to yield products of immense value. Mr. Thomas Campbell Deputy Magistrate of Seeliegunge and Mr. Charles Davies of Ackbarpore, could however give much more information as to the mineral resources of the valleys of the Soane and the Koyle than I can pretend to do : the former gentleman from practical experience being well acquainted

with the coal bearing strata of Palamoo : and the latter from long residence at Ackbarpore, with all the rocks within a circle of 50 miles of that place.

2. Coal may fairly claim the first rank, as without it all other mineral ores are deprived of $\frac{7}{10}$ of their just value : as although perhaps Iron smelted with vegetable charcoal may and undoubtedly is for many purposes superior to the same article smelted by mineral coal : yet charcoal could only answer in India for a very limited production of the king of metals, and without coal, $\frac{6}{10}$ of the valuable ores of India must remain in the quarry useless for all industrial purposes.

3. Abundant quarries of the *per* and *prot* oxides of iron as also of sulphate of iron, abound in the accessible portion of the Kymore range* in Shahabad and in Mirzapore north of the river ; but I am not aware that any coal has yet been discovered in these parts : and although most of these ores are peculiarly rich in metal, some of them even yielding 70 to 75 per cent of pig iron, without accessible coal they are almost useless.

4. The canal system for Shahabad and Behar proposed by Major Dickens, and I believe now sanctioned by the Supreme Government, will have the effect of bringing the cheap coal of Rewah and the valley of the Koyle river, to the quarries of iron ore : while the flux required for smelting in large masses being carbonate of Lime, already exists there in exhaustless abundance, and there is but little doubt that tramways and Railways will, in the not distant future, largely develop their mineral resources, as from what little I saw it will answer a double purpose : the Koyle valley and also the higher valley of the Soane river will prove to be a large cotton producing country if not also of more valuable products, so that tramways, Railways, canals, and good roads are as ~~great~~ a certainty for those parts as they have proved to be for the metaliferous and manufacturing districts of England :—still

as at present we must deal with them in their actual state, and view them as they now exist, we must look upon their vast deposits, as not one tenth known and as completely undeveloped for any large practical purpose.

5. Considerable quantities of iron, and that some of the best in India, is annually produced in Palamow, Rewah, Bigdjejghur and Singrowlee. The Singrowlee Iron in particular bears a high character in the market, being tough, flexible and easily worked :—while English Iron having been originally smelted from an inferior ore (the clay ironstone) and with mineral coal is almost unworkable by the native blacksmiths.

6. The greater portion of the ores, which are spread very largely over the table land, of the Kymore plateau, and in the face of its precipices, are found on and in what is generally supposed to be the old red sandstone, superlying mountain non-fossiliferous limestone, but as the best authorities have not yet decided the age of these rocks, it is obviously impossible for me to do more than follow the generally assumed theory, and call the rocks by the same name as Col. Sherwill has done, "*old red sandstone.*"

7. The whole of the Kymore range thus appears to consist of old red sandstone rocks, superlying mountain limestone of indefinite thickness, while the Jasper rock and trap rock cropping out occasionally in the Soane, near the base of the main spur which is the Roh-tass range, a main spur of the Kymore range, would lead one to suppose that that strata was the underlying one of the mountain limestone. Again at *Chynepore* at *Sonar* near *Sasseram* and in other localities igneous action would appear to have taken place, upon the sandstone, more or less rendering it intensely hard and flinty : while interstices here and there are filled with sulphate of iron, and a substance resembling iron slag, almost as hard and heavy as iron itself. A little further south, almost seven miles from Southern base of the Sasseram spur, an offshoot of the Roh-tass range, is found the granitic rock of *Bummonce* cropping

up above the surface to heights varying from 1 to 60 or 70 feet. These rocks are full of fragments of felspar hornblende and quartz in large and broken masses, and would appear to have been mixed with the great mass, much as plums are mixed with a pudding, i. e., while in a soft and ductile state. The base of the whole is a coarse granite. Thus we have three different bases cropping out:—which must either wholly or in parts underlie the mountain limestone. 1st. the Jasper and trap rock in the Soane, the semi-igneous rock at Chlynepore and wholly igneous one of *Sonar*, lastly the conglomerated granite rocks of Bummonee: while up to the present time the mountain limestone which is the visible base leaves us in the dark as to its origin by a total absence of fossil remains. I have seen what I thought to be fossils of fern in it, and as Mr. James Henderson thought he had discovered shells and infusoria in the limestone, and in one instance a well marked fishes tail, (such as described by Hugh Miller in his old red sandstone) in the sandstone; but the general opinion pronounces otherwise:—and Col. Dickens cautioned me against any hasty conclusions in the matter when so many Doctors differ: that I can simply state my own belief that the main rock of the Kymore range is old red sandstone, and shall thus call it in speaking of it in future. I have now in my possession a polished specimen from the igneous rock of *Sonar*; which has plain fossil shells in it, which shells have remained unaltered further than being with the rest of the stone turned into a vitreous mass by the intense action of heat which the rock had undergone. I am further fortified in my belief that the range is the old red sandstone by a late discovery of my own. Small deposits of almost pure carbonate of lime resembling greatly in appearance the Lias of England above the sandstone and which is here and there found in concrete masses overhanging the precipices; and which deposits burnt into lime combined with brick-dust form the finest hydraulic lime I have met in the coun-

try : * while the mountain limestone underlying the sandstone is singularly deficient in hydraulic qualities, though a noble lime for other purposes and I believe the limestone underlying the European old red sandstone are also non-hydraulic. These deposits discovered by me are all above the plateau and on the table lands proving the latter to be a later previous formation to that of the sandstone. They are not an outcrop of the limestone strata below because their geological character and their commercial value prove otherwise, while the sandstone strata unbroken below these deposits (which I have as yet only found on the edge of precipices,) entirely shews that they are a later deposit. I have given the fact. I shall now leave for better geologists than I to draw conclusions from them, merely stating in addition that the spurs from the same range which reach the Ganges at Chunar and at Mirzapore shew the same general character : though I have not heard of any limestone deposits being found above them.

8. The heaps of Iron slag found here and there in the deep

* Since writing the above I sent a large specimen of this calcareous deposit to Mr. Oldham Supt of the Geological Survey of India and requesting his opinion of the Geological character of the same, venturing my own opinion that it was a *lias*. He favoured me with an answer dated 27th May 1862, of which the following is an extract

"It is a good specimen of what is known to mineralogists and Geologists as calcareous tufa. It is the deposit of springs and waters charged with carbonate of lime, and it is frequently found in situations similar to that described in your letter, and often also is found to contain casts of leaves, stones, shells &c. Being for the most part pure carbonate of lime, it generally makes an excellent lime, often rather fatty.

"It is also frequently hydraulic; though seldom so thoroughly so, as some of the older and more massive limestones. When compact it forms what is often but erroneously called Oriental Alabaster.

"Its mode of occurrence overhanging the precipices as you describe it, is clearly due to its mode of deposition layer after layer from water trickling over the surface of the rocks."

Thus a new formation is going on : the carbonate being produced from the debris of burnt or decayed vegetation as these rocks are some of the highest in the range and are sandstone to their summits.

valleys fronting the plains of Shahabad, and the same kind of heaps found nearly all over the table lands prove that the native iron smelters, formerly smelted largely in the Shahabad hills of the range and also at their foot. I am not now however aware that any furnaces are at work in Shahabad:—the smelter appears to have retreated to Palamow, Bidjeyghur, and Singrowlee, though why they should have done so seeing that ores of the same nature exist equally here and there, can be attributed to nothing more than the caprice of a half wild tribe, retreating from a gradually advancing semi-civilization in Shahabad to localities still more in a state of nature. The forests there are also less subjected to the axe than in Shahabad and abundant fuel on the spot for the charcoal which they use in their operations may be the cause. Another cause is probably the neighbourhood of their Muhajuns at Ahrorah and Bidjeyghur &c. as there are now no Iron traders in Southern Shahabad.

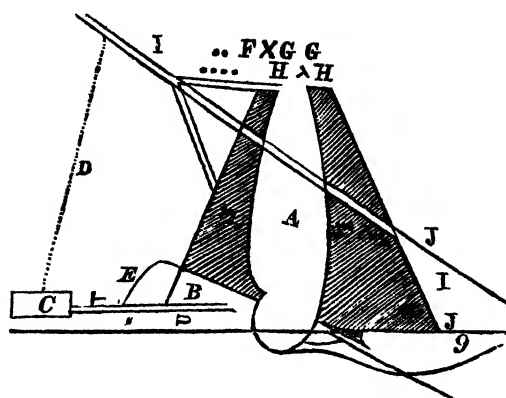
9. Although there is abundance of Mineral coal in South Mirzapore in Palamow, Sungrowlee and Rewah, the native smelters use only the wood charcoal prepared by themselves: and as their furnaces and tools are small, and can all be constructed and arranged by one man in half a day:—their fuel and ore are close at hand to the furnace, the latter being remade further into the jungle to suit there their main requirements, while the wretched hut in which they live may well be prepared in the half day remaining.

10. The process employed by them in smelting is a very simple one indeed. The furnace is built of clay, something like a small hollow cone larger in the middle and spiring up to the chimney and down to the blow hole with a table at the top formed of bamboos, covered with clay and of about 2 to $2\frac{1}{2}$ superficial feet in area. The internal area of the furnace is not more than 2 or $2\frac{1}{2}$ Cubic feet, and is also not more than from $2\frac{1}{2}$ to 3 feet in height something like the rough section in the margin. Thus:—

A. Interior of the furnace.

B. Fire Hole
—also hole from which slag and melted metal is drawn.

C. One of 2 round calabashes with a skin covering and a string



connected with the flexible Bamboo. The smelter treads upon the skin covering with a dancing motion, raising his feet in a peculiar manner alternately :—exposing and closing the centre hole in the skin cover of the calabash, and at the same time holding on by his hands to the two Bamboos right and left of the furnace steadying himself and alternately raising and depressing the string connected with the flap of the calabash with the same motion, and occasionally feeding ore and charcoal from the table with a small wooden scraper which he holds at the same time in his right hand. Two hollow bamboos cased with clay each connected with its own calabash, and meeting at the nozzles which are brought into one focus in the luted fire hole. This is a primitive and powerful bellows and furnishes a strong and constant stream of air for the blast, and thus keeps the half melted metal and charcoal in a bright ignition. As the charge falls more ore and fuel are pushed in from the table, the dancing motion, and consequent blasts being constant.

D. String connecting the bamboo holders with the skin covering of the calabash bellows.

E. Hollow Bamboo blast tube passing from the bellows to the furnace.

F. Bamboo table loaded with ore broken small and mixed with charcoal for the feed.

G. Top of furnace.

H. Walls of furnace.

I. Hole from which melted slag is occasionally withdrawn.

J. One of each of the side Bamboo holders.

To each furnace there are two men, and it is kept in full play all day. In each day—if the smelters have wives and children to break up the ore into $\frac{1}{2}$ or $\frac{1}{4}$ inch cubes and bring charcoal:—they will charge the furnace 4 times, and the day's work will be 4 or 5 small malleable pigs of 2 to $2\frac{1}{2}$ seers each, or in all 12 annas to 1 Rupees worth of iron. They employ no flux, and the slag runs off first in pipe like lumps, the furnace is emptied at each charge, the metal never runs liquid from the furnace, but falls to the bottom, below the blast tube, from whence it is taken in a flaming mass by a pair of iron tongs, and which incandescent mass is hammered on a hard stone or if the smelter is rather rich on a rough iron anvil into a double wedge-shaped pig:—and so on *ad infinitum*, the labour being divided between the smelter and his family who think themselves fortunate if they can earn $1\frac{1}{2}$ annas per head. I once erected a small brick furnace and used three large blacksmith's bellows for a blast, using mineral coal and a Limestone flux, but although I smelted the Iron yet from want of acquaintance with the *modus operandi* I ran off metal, slag, and flux in one homogeneous mass, so that my pigs were of no value. I saw enough however to convince me of the extreme richness of the ores, and to feel certain that they would ere long be found one of the mainstays of India in the economical construction of Railways. I had bar iron forged under the hammer, which was tested against English rolled bar iron and found superior in tenacity and strength but more flexible. Major John Laughton of the Bengal Engineers proposed its use for lattice bridges on the grand trunk road, but no further action was taken, nor can any great action be taken in the matter till Rail, tramway or

canal brings the coal to the ore—or the ore to the coal as may be found most economical:—then the valleys of the Soane, Royle and Norbuddeh will soon become the Crewe and Wolverhampton of India.

11. The cost of the ores would be merely nominal probably not more than 2 per cent upon the cost of quarrying, the ores being all above ground would reduce the cost of quarrying to a minimum. I should therefore say one rupee per Ton for Royalty and cost of quarrying would give an ample margin for all contingencies:—allowing rates of labour to remain as at present.

12. Charcoal as at present used by the native smelters may be obtained at 10 or 11 maunds per rupee, say $2\frac{1}{2}$ to 3 rupees per Ton in the forests to which of course must be added cost of carriage to site. Native charcoal is however made in open kilns in a most wasteful manner: burnt in closed kilns more than double the quantity and that of a much better quality would be obtained while the Tar and wood vinegar obtained at the same time would materially diminish the cost. Mr. Campbell when manager at the Rajarrah coal mines in Palamoo informed me that the mineral coal cost at pits mouth half an anna per Maund or at 32 maunds per rupee, less than two shillings per ton. The cost of carriage to the Soane river, profit and other charges, enabled him to sell it on the bank of the Soane at about 14 shillings per ton, with a Railway tramway or canal, it could be sold with a profit at six shillings.

13. Singowlee pig iron is sold in the market of South Shahabad and Mirzapore by the native smelters at from 8 to 12 seers per rupee that is from about £14 to £22 per ton—and that allows for bullock carriage and Muhajuns profit at each market.

14. The only means of conveyance from the furnaces to market is by pack bullocks. Much of it is however made into tools &c. on the spot by local blacksmiths and then sold at 6 seers per Rupee.

15. After Iron ores, the next most valuable in the neighbourhood is Coal, which however is not found in Shahabad: though probably when the search for it becomes important it will be so. It is however a common mineral on the East bank, and all along the valley of the Koyle River where it in several places crops above the surface. In Palamow, Rewah Singrowlee and other districts, it is abundant. It is worked by the Bengal Coal Company at the Rajarrah collieries in Palamow in the valley of the Koyle:—and by other parties in South Mirzapore but I speak within bounds when I say that $\frac{1}{10}$ th of the coal producing localities are not known to the world and are only partially so to a Mr. Sweetland who made the valley of the Soane River his study.* I cannot do better than direct the attention of government to an accurate Geological survey of this part of India. Its value and cost in these days of steam and railways will be speedily acknowledged and repaid. Such a measure will soon become an imperative necessity—then why not take the initiative and the credit.

16. I have already said that the so called Mountain Limestone underlies the whole of the Kymore Range in Shahabad:— and it also shews itself along the valley of the Soane as far at least as Mungeysurn peak in Mirzapore. In some parts as in Rohtass it crops up boldly to 2 and 300 feet, forming a sloping base to the precipitous sandstone rocks. In these places I have noticed what I think are three well defined strata:— an upper one of a yellowish blue mixed with disintegrated sandstone, sulphate of Iron—and chalk all in thin plates—Below that a more dense blueish grey limestone with occasional calc spar crystal but generally of the same nature as the German lithographic stone. I have had stones for lithographic purposes made from it and such have been used in the office of the surveyor general of India. The first stone used was made by me and used in the press of Shah Kubeerooddeen Ahmed of Sasseram. It answered ad-

mirably for the propose :—but the stone must be freshly quarried or it chips, as after exposure to the atmosphere it grows intensely hard and could then only be sawn into shape. Outside stone of limited size can only be obtained owing to the ages of debris and decay which cover the main strata :—but after quarrying some feet in to the *living* rock I feel satisfied from observation of the quarries that lithographic stones of any size can be obtained. This I believe is a most valuable discovery as lithographic limestone has not I believe been elsewhere found in India.

Under this again lies a very dense bluish grey limestone mixed with veins of calc spar. It is not used by the native lime burners as being untractable. This is the lowest strata that I have seen and would be an almost indestructible building or flooring stone from its great hardness—much harder than granite and approaching to porphyry. It may be had in large blocks, and if sawn into slabs would be a very handsome building stone, bluish grey with white veins, and would probably make a superior lime.

Immense quantities of lime are made from the quarries on the western bank of the Soane, and exported down the Soane and the Ganges as far as Monghyr. Perhaps 30 to 40,000 tons are made yearly and the material is inexhaustible.

The same limestone rock crops out on the Northern face of the Range at intervals between the Soane River and Mirzapore, and again especially in the singular and interesting Limestone caverns of Goopteswar in the valley of the Doorgowtee River at Beetree. Bund, in Khawah Koh, at Massaye on the Soorreh River and near Mirzapore : with canals and tramways these quarries could supply all northern India with some of the purest lime in the world.

The Cost of the lime produced at these quarries varies from Rs. 6 to Rs. 16 per 100 Maund or say 5 shillings to 14 shillings per ton. The present native system of lime burning

is a very imperfect one indeed and only suited to a very rude state of society, but with European supervision although perhaps the material could not be produced cheaper: it could be produced with much more certainty and evenness in quality. The great fault of these limes in the market is their excessive adulteration with chalk white clay (disintegrated limestone) and wood ashes but the ores are pure: and when burnt in the European fashion leave nothing in their quality to be desired.

17. *Chalk* is dug in the limestone range in the valley of the Soane, and varies in the colour from yellow—where it is stained with oxide of iron—to pure white:—also from the dense hard substance of bluish white stone which has to be crushed and remade by water to the pure white chalks. Quantities of this mineral are exported to the River market on the Ganges. The best quality is probably worth £1-10-0 to £ 2-10-0 per ton on the banks of the Soane River.

18. *Geeroo* much used in painting—It is abundant in some part of the range and is nothing but a pure chalk densely coloured by protoxide of iron. This is almost half the price of chalk.

Vitriol was once largely manufactured on the banks of the Soane in Shahabad from Sulphate of Iron once the product of the Kymore Range, but the death of the gentleman who instituted the manufacture stayed it. It is now only a native manufacture on a small scale of which I can obtain no particulars.

20. *Sandstone*. The sandstones of this range have a high commercial value at Chunar and Mirzapore for flagstones and ornamental work. The stones at these places owe their advantage to the proximity of the Ganges, which afford them an easy river carriage, otherwise they are the worst and most destructible stones in the range. The Millstones of Chynepore, Sasseram, and Tilowthoo, perhaps I may also add Ackbepore, are famous; but must always be dear in a distant market for

want of river carriage as the Soane is seldom navigable. The Soane Causeway and the Koylwur Railway bridge is built of the dense sandstone of Sasseram while even better qualities are found in the higher portions of the range towards Rohtass. The best stone while easily workable is almost as hard as granite, and may be had of any color—white crystalline, blue-grey—and all shades to a dark red.

21. *Alum shales* abound in various parts of the range but have not so far as I am aware been yet worked: so have no commercial value.

22. *Sulphur* is plentiful in some localities combined with oxide of iron, but would be only useful for the purpose of extracting vitriol.

23. *Potstone* is found in several parts of the range, and from some quarries can be had in large slabs and in great variety of colour. It takes a high polish, and might be used for a great deal of ornamental work, want of cheap carriage is against its being much worked. It is at present simply taken to Benares for the purpose of making images of gods for temple or private worship or used locally. I call it potstone because it has many of the qualities of that stone, and it is called indurated potstone by Col. Sherwill in his geological survey. I do not however think that it is potstone, but would rather suppose it a fine sandstone stained of a darker hue varying from greenish to dark brown (and when polished, black) by some mineral oxide and hardened by the igneous action which I have elsewhere described as characteristic of portions of this range. Whatever it be, it is a useful stone and deserves to be better known than it is. I believe Mr. C. Davies sent a slab of it to the great Exhibition of 1851.

24. *Saltpetre and Salt*. These are produced abundantly in some parts of Shahabad but as they are a common product all over India, but little need be said here. Crude Saltpetre is prepared at from 6 to 7 Rupees per local Maund by the Nooneas, this in its crude state would be from £ 15 to £ 18 sterling per

ton : while the salt produced with the saltpetre is of a coarse kind and only sold to the poorest of the community under the name of *Khareenimuck*. It can however easily be purified by boiling as I have myself proved and then it is a good and pure salt.

25. This paper on the mineral resources of this part of India would hardly be complete without my noticing the important and singular fact that the strata both in the North-East and South faces (where the face of the plateau towards the plain is invariably precipitous) has a considerable dip inwards varying from 5 to 45 degrees. This circumstance prevents any springs making their appearance on the face, which would have the effect of draining the table lands dry, and would render them a desert. The fortunate dip has a contrary effect, retaining the moisture as in a basin and water in consequence may be had in most places on the table lands at a moderate depth :—while in several localities springs of pure and limpid water flow above the surface all round the year. Consequently numbers of villages, small certainly, but still villages, stud the table lands, and I am of opinion that not many years more will elapse before large tracts are brought into a more profitable cultivation of Coffee Cotton and oil seeds by European energy and skill. The finest rice produced in the district is already grown in the shallow valleys, and where the soil has been subjected to the plough prove by its abundant crops what it will produce in the future. I will now close this Section, and am only sorry that the information at my command has been so limited, but trust it will at all events stimulate some abler hand to examine the subject and give the result that publicity which its importance deserves.

26. I am preparing a wooden model of the native method of smelting Iron in the Kymore Range which shall be forwarded as soon as ready which will be in a few days.

This section on minerals being now completed it appears

to me that it would be more agreeable to yourself for many reasons that I should send it at once. The other sections shall follow in a few days.

I have &c.

R. W. BINGHAM.

SECTION. II.

Vegetable Fibres.

1. The vegetable fibres common to this part of India (Shahabad) may be described

- I. Cotton (*Gossypium Herbaceum*),
- II. Hemp (Sunn) *Crotalaria Juicea* (Flax,)
- III. Hemp (Puttoowah) *Hibiscus Canabina*,
- IV. Do Gunja or Bliaung) *Canabis Sativa*,
- V. Do (Madho Latta) *Gaertnera racemosa*,
- VI. Manjon (an inferior hemp) *Saccharum Munja*,
- VII. Semul (or silk cotton) *Bombax Heptaphyllum*,
- VIII. Moulain (bark of a creeper,)
- IX. Buggaie grass,
- X. Choqe (from roots of Paras pipul) *Hibiscus Popu-neoides*.

2. There are other known varieties, and doubtless in the hills of the Kymore Range, many others might be found, but for commercial purposes at present I think I have embraced all used varieties in the above List. I might add Linseed (*Linum usitatissimum*) as a flax yielding plant:—and one which is now being cultivated for that purpose in the Punjab, but as in Shahabad and Behar although extensively cultivated; it is only so for its oil bearing seed, as a flax plant it has no commercial value.

3. Cotton is produced largely in this and the neighbouring districts and is always grown on light sandy loams or vege-

table loams—never in the *karile* clay which is I believe elsewhere called the black cotton soil :—neither can I understand how a cotton plant can grow on such a soil. It is possibly a mistake in description and I should rather imagine the dark alluvial desposit that is a vegetable loam to be the soil which superficial observers have taken for the *karile* or black impermeable clay. Certain it is that in this district no cotton planter would attempt to grow cotton on *karile*, or, if he did, his labour would all be thrown away. This however leads to the observation that what is the case in one district may be the reverse in another, as the differences of soil and climate in this vast Empire are so great as to render any practical generalization impossible. In proof of this, in some parts of the Deccan it is said that cotton is injured by Irrigation while in Shahabad, Behar and the North West, no cotton would come to remunerating maturity without Irrigation. This fact alone—coupled with the black cotton clay which is said to be the cotton soil of *Allahabad*, *Goozerat* and *Darwar*, proves that any attempt at generalization would only lead to fallacious results. I therefore prefer to speak only of the district which has come under my own immediate observation.

4. The production of cotton in India may however be fairly said to be only limited by the demand :—and by the facilities for irrigation which the country enjoys. Thousands—nay millions of acres are now barren which could yield cotton equal to any in the world. Portions of the Kymore Range, the now unproductive jungle land in the valley of the Soane, the alluvial lands in the valley of the Koyle river, immense tracts in the now half cultivated portions of Shahabad and Behar—are all suitable for a cotton cultivation, but three things are wanting. First capital coupled with European energy and skill; *second* good roads and cheap conveyance to the distant market;—*third*, a good contract law, and speedy and accessible justice. All of them are at present wanting in India; but ~~with them~~, the country would speedily become the garden of the

world : and England being its sovereign and with her mighty manufacturing power and her vast mercantile marine to work up and carry the rare productions of Hindostan to her own shores, and the manufactured article to all parts of the world, holds out a future for both countries which I am afraid to dwell upon, as if I allowed myself to do so, I should be called a visionary. It is sufficient here to say that with India as the producing and England as the manufacturing country :—the benefits to both are certain, and fraught with mighty consequences to the whole world.

5. In Shahabad and the neighbouring districts cotton as I have said above is largely grown : but want of roads, vehicles, and cost of conveyance to our only port—Calcutta ; makes it principally cultivated for local consumption. It is also said that for local consumption and for export to China a better price is obtained, than can be obtained for the article for export to Europe : while the means of Irrigation at command, and it—(like all the other products requiring more labour than merely ploughing the land, sowing the seed, and reaping the crop) being only a class cultivation :—its production is limited by the price obtained. It is evident however that large quantities are raised, because in spite of all obstacles large quantities are exported from Ghazeopore, Patna and other river ports, and at least seven tenths of all the people are clothed in cotton goods of native manufacture ; while the winter clothes and beds of those (who can afford such luxuries) are thickly padded with cotton of indigenous growth. At any market, cotton is to be sold either uncleaned or cleaned from seed and also bowed :—while cotton seed forms an important article in the list of food for cattle and for oil manufacture.

6. No one now doubts but that cotton of any quality can be reared in this country and to any extent ; but it must be left to European energy and capital to improve the staple, either by introducing superior seed and better modes of cultivation,

as also by better methods of separating the cotton from the seed, and preparing it for the market: while easy and cheap modes of conveyance are an imperative necessity. The "woven wind" fabrics of the looms of Dacca sufficiently shew however that even the native can produce a staple of surpassing fineness; and the diapers and dimities of the Puttialla states shew what Indian cotton can be woven into; and I am beginning to think after all that cotton of fine enough staple for any purposes is already produced in various parts of India; but want of roads and canals, has kept these cottons from the European markets.

7. There are no less than five (5) varieties of country cotton known in Shahahad, and it is probable there may be even a greater number:—but I have ascertained that these five varieties are commonly cultivated, they are:—

I. <i>Barrocha</i> ,	} These kinds are sown in Ashar corresponding to June and commence to yield in Feby. and March, continuing to yield through the month of April. They are regularly irrigated from the month of January and the field well hoed and kept clean of weeds. The plants grow to 3 or 3½ feet in height. The yield of kupas is from 6 to 8 maunds per Beegah of 3025 square yards or say from 640 to 1000 or 1100 pounds of kupas to the acre. Three fourths of this is seed and ¼ is cotton fibre fit for market.
II. <i>Numnoonah</i> ,	
III. <i>Huontie</i> ,	
IV. <i>Nirmah</i> ,	

V *Bhureearh*. This is sown in the month of October, and is not watered unless the season is a very dry one. It commences yielding in Feby. and continues doing so till May, or June. During that time it is regularly dug and weeded:—and during the rains pruned: as it is a biennial plant and yields a second crop in the following year. It is not probably so good a cotton as the other varieties, which it can scarcely be, not being so carefully weeded and watered as they are, but no doubt more attention paid to these matters over a series of years, would do much to improve both staple and fibre.

8. The only instrument used for cleaning the cotton from the seed is the rude and imperfect Indian chorka, which has but two merits ; the one is that it does clean the cotton, and the second is that it does not appear to injure the fibre. These qualities are however neutralised by the painfully tedious mode of its operation ; which renders it totally useless to any but the careless plodding native of India, whose earnings by it are never more than a penny a day, while its creaking noise has the effect of keeping the operator in that state of semi somnolence which next to perfect sleep is with them their greatest good. The chorka would never suit the go-ahead, time-valuing European or American. It is always worked by women.

9. The next process undergone by the cotton is "bowing". This is done by the bow and mallet, so often described and is the work of a man who will earn from 2*d* to 2½ per diem.

10. There are no Cotton presses known in the district, the cotton is simply pressed into bales by treading :— but as it is all or nearly so used for local consumption in Shahabad and what little is exported is sent down the Ganges in the clumsy and unwieldy Cotton Boats of that river, the tightness of the bale is not of much consequence : but as a larger export trade grows up, doubtless pressing and screwing will be then attended to ; as exporters will find it to their own interests to press their bale into the smallest possible compass ; and will erect cotton screws at the head quarters of their trade for the purpose. The uses to which the prepared fibre is applied will come under the section of Manufactures.

11. *Sunn* (Homp or Flax) This is grown largely in many parts of Shahabad and is used for Ropes, Cordage, twine &c. &c. It is a rare crop and ripens about the month of February and is produced from the *crotalaria juncea*. I cannot tell whether much is exported or not, not having any data to guide me in the matter. The dealers in country produce would be the best informants and there are several in Ghazee pore and Patna. The plant when the seed is ripe is thrashed to

separate the seed, and then the stalks are steeped in stagnant water for varying terms from 20 to 30 days according to the weather. It is then scutched by hand and rudely prepared for market where it is sold at from 10 to 15 seers per Rupee or say at from 50 to 75 shillings per ton. The price does not appear in this and the cognate fibres to be regulated much by the demand; but rather by the quantity produced per Beegah. The grower expects a certain sum per beegha, and if he does not get that sum ceases to grow that particular article, but undoubtedly if a large demand should arise, and roads, Railways, and Canals afford more facilities than at present for carrying the article to the market;—any quantity could be raised. At present it is principally grown for local consumption. One Ton of stalk would give about 4 cwt. of fibre, the stalk is then useless for any other purpose than fuel or manure.

12. Hemp, (Puttoowan or jute) This is cultivated largely as a rain plant; but always sown in conjunction with some other seeds such as *mothah* Dall-Ruhur &c. &c. It is much like the Hollyhook of our gardens in appearance. It is the *Hibiscus Canabina*. The fibre is more prized for many purposes to the real hemp, and large quantities of it are now exported to Europe:—while all bags for grain or other purposes are made from it. It may be had in every bazaar either as a coarse fibrous hemp or as twine or coarse canvas. It is the substance used by all the Ganges boatmen for their sails, and is a profitable cultivation on light sandy loams when rains have been abundant. It particularly loves the new thrown up subsoil which forms the banks of tanks, or indeed any kind of made earths. Its seed is valueless for any other purpose than for resowing when ripe which is in November and December: the plant is cut down to the ground, then steeped in the same manner as any other hemp yielding plant from 15 to 25 days, but is not afterwards scutched but instead of that process the fibre is peeled off in long stripes by women and children. It is cheaper than hemp and of much easier cultivation;—the cultivation

increasing yearly. Probably if a better mode of preparing the fibre were introduced ; it would result in the production of a much superior article. This however is conjecture.

13. *Hemp* (Ganja and Bhang) from the *Canabis Sativa*. This yields a superior flax to the above plant : but as it is an Abkaree cultivation, only small plots are cultivated here and there for the *Ganja-Bhang* and *Majoon* produced from its leaves. These are highly intoxicating drugs and would come more properly under the article of medicinal substances ; were it not that the bark yields with careful preparation a fibre which would answer well for coarse canvas and other purposes. Whether from its other known qualities it would be safe to cultivate it in large quantities is a point that I will not here venture to discuss.

14. *Hemp* (*Mudho* or *Maltalatta*) This produces a very superior fibre with great length of staple and as it requires little or no cultivation, would, it appears to me, be a most valuable production. The plant however takes some years coming to maturity. It is a kind of aloe—*Gaertnera racemosa*, and is much used for fences, as when full grown it is impassable by cattle or by men, and might be a useful defence to fortresses grown under the Ramparts. Its impenetrable shade however harbours vermin. I have seen linen canvas and duck woven from the fibre which appeared to me to leave little to be desired. The preparation of the fibre is very simple, simply slightly macerating the leaf and then beating it with wooden mallets on a stone to separate the fibrine from the woody and other matter. Doubtless an improved method of separating the fibre would produce a superior article. I am not aware that in this district at least it is an article of commerce but much of it is prepared for private consumption ; as it makes first rate well ropes.

15. *Munj*, an inferior hemp prepared from the bark of the tall grass called *Saccharum Munja*. It is much used on the banks of the Ganges for rope, and towing lines for the river

boats:—and also for roofing string, but I am not aware that it has become an article of export. Its production could be increased indefinitely:—as it is a plant requiring no cultivation whatever. It would probably make a good cordage.

16. *Semul* (silk cotton) the produce of a large tree *Bombax Heptaphyllum* very common in the forest of the Kymore Range and I believe in most parts of India. I have seen specimens of cloth woven from it, which appeared rough but warm and comfortable. Its principal use is however for stuffing beds and pillows, for which it requires no preparation, and I have little doubt, were the article known in Europe it would in a great measure supersede feathers for stuffing beds and pillows, being a vegetable fibre and as soft as swan's down, it would in damp weather be more wholesome; while it could no doubt be turned to important use in some materials as an auxiliary to cotton, to which its peculiar luster would impart a glassy and silky appearance. This however must be left for manufacturers to decide.

17. *Moulain*—this is the beaten fibre prepared from the bark of a common gigantic liamis of the Kymore Range. It is also known in the Rajmahul hills, and probably all over India and forms a very serviceable substitute for strings made from Hemp or jute for roofing and other purposes.

18. *Chope* or *Chobe* is a similar substance prepared from the bark of the root of the *Paras Pipul*, and is much used as tethers for cattle, and many other agricultural purposes. These can be obtained in any quantity and at a very cheap rate.

19. *Buggaie* is a wild grass which is ready for cutting in October and November. Several hundred thousand maunds are cut annually in the forest of the Kymore range:—and it is sold for roofing and other purposes, when made into a coarse twine it answers for tying thatch and bamboos, as well as for bottoming the cots or charpays of the lower orders as well a more expensive article. Much of it finds its way to the river,

ports but I fancy it is all consumed in this country, and would be but of little use in the manufactures of Europe.

20. Many other fibrous substances are known to the natives and locally used, but the above are all that I am aware of as known to commerce. It must therefore be left to commerce to develop other products. I have not included the silk or the tusser silk in this article:—as I am only treating of vegetable fibres, and as they are animal tissues their introduction here would be out of place, and they will perhaps come in with more propriety under the section of manufactures.

R. W. BINGHAM.

CHYNEPORE: 1862.

Hony. Asst. Magistrate.

SECTION III.

Oil Seeds.

Oil seeds of one kind or another are of universal cultivation all over India, and the cultivation of them is capable of almost indefinite increase. In fact the cultivation of the staple will only be limited by the demand. It possesses a great advantage over all the staples, inasmuch as it is one already familiar to the people all over Hindostan; and most kinds of oil producing seeds under cultivation, can be cultivated in conjunction, and as an auxiliary, to any and almost every crop. Oil bearing seed are sown equally with wheat, oats, barley, grain, motha: Ruhur and in fact with every thing but rice.

2. Every village has its *Talee* i. e. oil presser who after a most primitive and laborious fashion (see model No. 2.) extracts probably $\frac{7}{10}$ of the extractable oil: and as he considers the labour of himself and family with the solitary bullock which patiently does his work, well paid if they earn their daily food: and like the animal he works with, asks for no more, the process if an imperfect is a tolerably cheap one.

3. The *chiragh* or small baked clay saucer with its wick of half twisted cotton, being the universal substitute for our lamp, and light only being wanted by the people for the simply animal purposes of seeing how to eat, or drink, or guard against reptiles and thieves during the night: it is not to be wondered at that they care little about the quality of the light: and I am only surprised they have not resorted to the expedients of keeping glow-worms or fireflies in bottles for that purpose: were it not that the cost of the necessary bottle and the trouble of catching the glow-worms or fireflies, would far outweigh in their opinion the value of their gratis light. The light they at present obtain by their *chiraghs* costs more during the month than the glowworm process would in a similar time: and gives almost the same light, but this extremely labour-saving people will disburse their daily half farthing for the coarse and unrefined oil which the village *Talce* or oilman expresses from the seed with which the people themselves furnish him; it being an understood fact that any oil *sold* by the village *Talce*, must have been *cabbaged* (I can think of no other phrase) from the seed given him by other parties for the expressure of their own oil.

4. You will see by the model of a "*village oil crushing machine*" forwarded with this, that the process is a very simple one indeed, and as the model accompanies this paper, it will be unnecessary to describe it further than to say that by the weight of the seed crusher himself, seated upon a moveable horizontal lever, pressing in its turn on a perpendicular beam (or nearly so) rising from it and working with a head piece upon the rough piece of wood in a sloping position aided by the eternal round of the bullock most primitively attached, without harness; the oil seed is crushed into paste and eventually hard cake in the large stone or wooden mortar in which this large pestil works: while the unpurified oil runs out of the orifice below into vessels placed to receive it. A fresh change of seed is introduced without much trouble:—and the old cake

extracted and so the work goes on from one year to another ; no improvement in the process being ever attempted or wished for. Indeed it is certain that if any cheap improvement should be introduced by accident : and the Talces by any chance be brought to use it, then customers would either not use the oil : as not being produced according to the *dustoor* or custom of their forefathers ;—or the Talce himself would use it as a *labour saving* machine in its primitive sense, i. e. he would only work it daily long enough to provide on his simple scale for his daily wants and then enjoy the true *otium dignitatum orientale* by an extra allowance of sleep and idleness : or perhaps in quarrelling with his fellows : but work longer or harder than necessary to secure his daily food he certainly would not ; and if urged to do so by his best customer would indignantly ask, “ what ? have I not food in my house ! ”—the said house being a miserable hovel, which an English or Scotch farmer would not condemn his pigs to, but which answers the purpose of a roost and a shelter for the peasant of Behar. He has no thought of the morrow ; when sickness comes on him he has no resource : and he either dies like a dog in a ditch or recovers to find himself in debt to his mohajun (or money lender) who treats him as a slave until his advances are repaid.

5. It has often struck me that the introduction by European firms of oil factories and oil pressing machines would be far better than buying the crude seed : and the cost of transmitting the prepared oil to the market would be far less than that of sending seed the same distance, while the oil cake produced could be easily consumed in the country as cattle food, respecting which there would be no prejudice to overcome : while the local consumption of oil from such factories would be great after the first prejudices were overcome. The factories might deal in a great measure on the principle of barter to suit native habits, i. e. giving a certain quantity of oil for a stated quantity of each kind of oil seeds ; as experience might dictate : while the establishment of such factories in the interior

would stimulate the production of the seed: and gradually a large commerce.

6. It will be answered to this that Hydraulic presses &c. have been instituted and have not answered. I answer that is true: and will shew reason, at least what seems reason to me why it should not answer. Man is a gregarious animal; and kind seeks kind; the consequence of this truism is that all efforts to Establish Oil Factories have been made in stations where our countrymen congregate together. What would be the fate of our Indigo planter if he established his vat and his head quarters in Patna, Bonares, Dinapore or in the Tank-square of Calcutta. The answer would be that he must soon shut up his establishment as an unprofitable speculation, while the same capital employed in the Mofussil earns him a competence, and sometimes a fortune. So it would be with oil factories properly worked. They must be worked on the site of the growth of their staple; and make themselves known to the people. Capital is wasted in stations for the production of country produce of any kind: and the adage holds good here as elsewhere: that it is "the early bird who catches the worm."

7. India even when wanting water for irrigation has still a vast water power at command for manufacturing and other purposes; and why the water power of her streams should not be used for flour mills, oil mills, and other similar purposes is a mystery, or would be so were it not that the government have hitherto systematically discouraged European settlement; and indisposed the independent European to settlement in the vast interior. Indigo planters are the solitary exception to the general rule and they have managed to extend with the extension of the empire: and had government and government officers been, in the first establishment of our rule, the local oil seed crushers, as they were the local Indigo planters and silk producers, probably that article of commerce also might at this time have been much more fully developed. It is my

candid opinion that the old crushing or pounding mill of England worked at first by water power here and there, would as a commercial speculation pay well : and at the same time by its local demand, increase to indefinite extent the cultivation of oil seeds ; while by giving a purer oil and by these improved processes extracting a larger quantity from the seed ; they would be sure of local custom eventually ; and again by the lightness of their article of export as compared with sending the seed to Calcutta and thence to England : with its compactness as to bulk and non-liability to deterioration, effecting a saving in freight and insurance and a consequent saving in cost to the English consumer, they would be certain of the English market to the exclusion of foreign oils and thus India and England (countries under the same sovereign) might mutually benefit each other ; but oil factories to be successful at present, I must emphatically state, must be located in the interior : in the same sense that an Australian sheep farmer : or an American maple sugar manufacturer locates himself in the "bush." I throw out these hints for what they are worth, and hope they will be dealt with accordingly.

8 The principal kinds of Oil seed cultivated for oil in this district are as follows.

- I. *Mustard seed* (*Sinapis ramosa*) *Sursoon*.
- II. *Rape seed* (*Sinapis dichotoma*) *Sursoon*.
- III. *Til* (*Sesamum Orientale*) *Til*.
- IV. *Safflower* () *Runum or Burge*.
- V. *Castor plant* () *Rheeree*.
- VI. *Linseed* (*Linum usitatissimum*) *Teese*.
- VII. *Cotton seed* (*Gossypium Herbaceum*) *Kapas*.
- VII. *Poppy seed* () *Ofyeun*.
- *VII. *Thistle* () *Bhur-Bhur**
- VIII. *Anise coriander and other seeds*.

9 In addition to the above there are the seeds of several trees more or less wild, at any rate not cultivated specially for their oil, but which still produce it in considerable quan-

tities, and in many instances to so large an extent as to have a recognized commercial value. They are:—

I. *Mahawah* (*Bassia Latifolia*) *Quoindah* or *Mahawah*.

II. *Nimb* (*Melia azadirachta*) *Nimb*.

III. *Chironjee* (*Chironjee sapida*) *Chironjee*.

and some others; but these are the principal and I may mention that the cocoanut palm does not grow in this part of India. I will now give what information I am acquainted with respecting them and the cultivated oil bearing plants.

10 *Musturd seed* or *Sursoon* (*Sinapis ramosa*.) This is grown generally mixed with the rape seed also called *Sursoon*, although the plant is a distinctly differing one, and the seed is a whitish yellow:—while the seed of the *Rape* (*Sinapis dichotoma*) is a dark brown. I have never seen them grown separately:—though such is the case in many parts of the country, and ought to be the case here. It is grown extensively all over the district principally for local consumption, and being sown in the month of October is generally sown as an auxiliary with grain crops, amongst which its white and bright yellow flower are easily distinguished. Being always sown as an auxiliary, it is impossible to ascertain what would be its yield per acre if sown separately. It loves the loams, and does not take kindly to any of the clays. It is ready before the close of February for cutting, and is always cut slightly grown—or the seed pods would burst and scatter the seed. Being cut the plant is dried in the thrashing floor by the heat of the sun, which does its work in 3 or 4 days, when the seed is easily thrashed out. Cattle eat the broken stalks, but I should not imagine it was a very nutritious food for them. It is sold in the Bazar at from 16 to 20 seers per Rupee, and yields under the native method of crushing 30 per cents of a tolerably pure oil, while the residue or cake is used as a food for cattle. It would yield more and a purer oil under the action of the oil pressing and purifying processes of Europe; and I think would yield 35 to 40 per cents

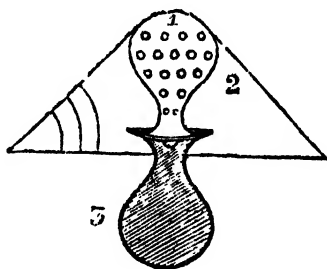
of its gross weight. It is largely used by the native community, with their food instead of ghee, under the name of *Metah* or sweet oil; although for all other purposes it passes under the name of *Kurwah* or bitter oil. Most natives prefer it for the preparation of their curries and other warm dishes. The native oilman gives 1 seer or 25 per cent of the expressed oil for every four seers of seed sent him, he keeping the balance and the cake as the price of his labour, so that with the seed at 16 seers per Rupee the value of the oil would be 4 seers per Rupee.

11 *Til* (Sesamum Orientale)—of this useful plant there are in this district two kinds, and both are extensively sown in various parts. The first is sown in July and is ready for reaping in *Kartik* or *Aughun*—say in November; the seed is sown in August, but they are both ready nearly at the same time. These plants are also sown as auxiliaries but with the high land rain crops such as *Ruhur*, *Motha* &c &c. The seed has about the same value as *sursoon* in the Bazars, but the oil being thinner and purer—and almost tasteless, while burning with little smoke, is extensively used in Indian perfumery. It is extracted from the seed in the same manner as the former. The residue or cake is eaten by the poorer classes as an article of food: and is greedily devoured by cattle. It grows in sandy loams.

12. *Safflower Kussum* or *Burriyals*—There are two varieties of the same plant: the first being without prickles and the other prickly. They both produce the Safflower dye of commerce, which is simply the flowers gathered while the seeds are forming. Owing to the prickly qualities of the *Burriya* it is not so much sown as the *Kussum*, as it is an unpleasant task to gather its flowers on account of the prickles with which they are armed: and it is generally sown with the spring cereal crops as a kind of fence. Its yield of seed is large, in proportion, and both kinds yield about the same quantity, the natives asserting that abstracting the flowers for dye does not

affect the weight of seed. I should imagine that this was a mistaken notion. The Kussum is grown largely by the *Quiries*, the same men who grow opium, and as they use both flower and seed; and irrigate freely, the plant yields largely. The oil is expressed in the same manner as the other oil seeds: after the husks have been removed the husks of the seed are thick and would weigh about $\frac{1}{3}$ of the weight of seed. When they are removed 25 per cent of the remainder will represent the extractable oil, which is of a light color and burns well. I am only surprised that it has not been brought more into use for English lamps. I use scarcely any other oil. There is also another way of extracting the oil, which is I think so peculiar that I will attempt to describe it. It renders the oil useless for burning purposes, charring it in fact:—but this is the oil used by the native agriculturist for greasing his well ropes, leathern well buckets &c. and in fact all leather work used for exposure to water. It is a rude still with process inverted, something like the rough sketch in the margin, a hole is dug in the ground deep enough to receive an earthen jar or *Ghurrah* of any capacity; on the mouth of which is placed an earthen plate with a hole of

1 Receptacle for seed
2 Fuel heaped up and fired.
3 Under-ground reservoir for oil.



about a quarter of an inch diameter bored in its centre. Above this is placed another similar jar nearly filled with the *Bhurrah* or Kussum seed inverted upon the plate. The juncture of the three is luted with clay:—and earth there filled in up to some inches above the juncture of the vessels, in fact up to the swell above the neck of the upper inverted vessel. Dried cowdung is there heaped above the upper vessel and set on fire. The fire is kept in ignition for about half an hour, when it is removed. The upper inverted vessel is found to

be about half full of charred seed and the lower one which was imbedded in the ground about one third full of a black sticky oil. By this process the oil as well as the seed is charred, but the natives assert that it is all the more valuable for the preservation of leathern vessels exposed to the action of water. It might be worth the while of chemists to enquire why this should be, and whether this kind of oil would be of any commercial value at home. The yield of oil by this process is more than a fourth larger than by the press.

13. *The castor oil plant* has two or three marked varieties and is largely cultivated principally for home use; but a considerable quantity for the castor oil Factories of Dinapore. The native process only succeeds in making a very impure oil, which is so offensive for its smoky qualities in burning that it is not sought after by them for that purpose; but only for anointing leathern well ropes, shoes &c. and being a cheap oil is largely used for the latter purpose. It is thick and viscid, and, extracted under the native process, soon turns rancid:—while by the European process it is next to the cocoanut oil one of the purest and best burning oils known. The plant requires scarcely any cultivation:—and in south Shahabad is oftener sown in the borders of a valuable field as an hedge than for any other purposes. It loves however a sandy loam, and will not grow in the clays. Its yield under the native process is about 33 per cent of the impure oil above described:—and I believe a larger quantity, and I know a purer oil is extracted by the European process. Newly cleared jungle lands grow the castor plant abundantly, and its extended cultivation is only bounded by the demands in the market, as long as the rates are remunerative:—for although the sowing and tendence of the plant costs little trouble; yet the picking of the seed is a troublesome process, and it requires a much larger amount of room to come to perfection. The natives sow and uproot the plant yearly. I do not know why this should be as it grows and yields abundantly the second and

third years in hedges or other open places. When cultivated by itself the natives always sow the seed too close, and consequently the plant is comparatively small :—for attaining its full perfection, no place is better for it than a hedge or a bank.

14. *Linseed* (*linum usitatissimum*) is a well known plant almost all over the world, but is in most parts of civilized Europe more cultivated for its flax than for its seed. In Russia and in India the contrary is the case, and it may fairly be said that in India its flax producing qualities are unknown. It is therefore cultivated as an Oil seed alone. It is however probable that the stunted plant grown in India would be of little use as a flax bearer, until improved cultivation had again raised its standard of height. • In the Punjab and in Scinde considerable attention has of late been paid to this subject and it would be an additional staple to the agricultural resources of Shahabad and Behar, could it be brought under cultivation as a flax bearer here, which it doubtless could be with the same advantage as in the Punjab. As this section is however devoted to Oil seeds alone I shall only consider the plant in that capacity, for which purpose it is largely cultivated. It is always grown in Shahabad as an auxiliary crop with wheat, Masoor, Barley and other spring crops; and its bright blue flowers are a pleasing relief to the yellowish brown of the other cereals. I have never known it cultivated alone, so that I have no data as to its probable yield per Boegah or acre. It would probably not be found to differ much from the Linseed crops of England in that respect: were the cultivation equal, by which I mean, were the same labour bestowed upon its cultivation, which however is not the case in this district at least. Its favourite soil appears to be the black clay (*Kurile*) but it is sown largely in other soils, and the only difficulty to its indefinite extension appears to be the want of facilities for carrying the crop to market. It is therefore grown in South Shahabad principally for home consumption, and is used

largely for lamps under the name of *Teese ka Tell*. Under the native process which is the same as previously described, it produces 15 per cent of Oil:—what it produces with the European method, I am unable to say. The native method produces a tolerably clear looking oil, but it smokes much in burning; showing that a large proportion of vegetable fibre finds its way through the rude press unto the pure oil: considerable quantities are grown near the Ganges for export. The price varies much according to the season and the quantity in the market. I have known it sell for Rs. 40 or £4 sterling per ton and I have known it fetch double the price. Until Roads—Railroads and canals with better modes of conveyance than exist at present, equalize prices, no average of price can be given, with any certainty: as one season in one part of the country, may have been favourable:—and in another part unfavourable, all within a radius of twenty miles and the two places shew a difference of 50 per cent in the selling price as well as in production, thus shewing how imperfect are the means of transport from one part of the country to another which would otherwise equalize prices by centering the produce in the dearest market till a medium was found, or in other words till further export to that place was unprofitable.

15. *Cotton seeds*—*Benoul* (*Gossypium Herbaceum* or *Indicum*) is the seed of the cotton pods of *Kupas* after the fibre has been removed by the Churka. It is more used as a food for cattle than as an oil producing seed and is considered in cotton localities to be a better food for the working Bullock than grain. It produces under the action of the native oil mill, 25 per cent of a good oil, which by being purified might grow into an extensive article of commerce. I do not think it would answer to export the seed as owing to the fibre adhering to it and perhaps from other causes it is very liable to heat, and deteriorate, in Bulk. The oil is said to be a very useful oil, more so than most others for machinery purposes.

16. *Poppy seed* (ofyeum or Postah ka dana.) The Poppy plant is largely cultivated in all parts of Shahabad and Behar as also in the neighbouring district, for the drug which is a government monopoly, the well known opium of commerce. The seed has no intoxicating qualities, but has a sweet taste and is used parched by the lower classes of natives as a food; it is also much used by the sweetmeat makers as an addition in their wares. This and the seed of the Til (*Sesamum Orientale*) are the only oil seeds with the exception of the cocoanut, which as far as I know is used for that purpose. It produces under the native method a clear limpid oil:— which however has the disadvantage of burning very quickly. About 30 per cent of oil is extracted and the cake is then sold as a food to the poorer classes. The oil at present sells at about 5 seers per Rupee. It appears to me that this oil if properly prepared would from its thin and limpid character be admirably adapted to supersede many of the purposes if not all where the more expensive olive oils of southern France and Italy are now used: and would be an admirable watch-maker's oil. I throw this out as a suggestion for more practical men to decide. The production of this seed is only limited by the production of the poppy. •

17. *Thistle.* *Bhur Bhur* &c. several species of the common thistles of India produce small black seeds which yield a large proportion of oil. These seeds are gathered only by the poorer classes and the oil expressed for their own use. It is very smoky when burnt, but otherwise of good quality. None of these thistles are an object of cultivation but grow abundantly in a wild state; and it is only noted in this place because it is a well known oil bearing seed.

18. *Anise seed* (*saumph.*) *Coriander seed* (*Dhoniah*) *Cummorin seed* (*jira* or *Kamun*) are all oil bearing seeds, but as they are the subjects of a garden cultivation, and are grown as spices and not for their oil bearing qualities I only mention them here in a recapitulation of oil bearing

plants. Their oil is extracted for perfumery and medicinal purposes, but I have no data as to the quantity of their yield or the commercial value of the oil.

19. I will now proceed to notice the few common oil bearing trees, as stated, under Para 9 of this paper.

20. *Mahawah* (*Bassia Latifolia*.) This is a forest tree growing in large quantities all over the country; and in great abundance in the Kymore Range. It produces a very hard wood which is serviceable for many purposes. Few zemindars will sell the tree, as it is a source of yearly profit to them. First from its flower-buds which drop when ripe and have to the European olfactories a very offensive and sickly smell. The flowers are used by the native distillers for the purpose of preparing the common country liquor, and are also used in cakes as food for both men and cattle which devour them eagerly. They fatten the cattle rapidly, but it would not answer to fatten cattle for the slaughter house, as the meat would have the offensive flavour of the flower. After the flower has fallen, the second source of profit is from a large kernel which is formed after the flower falls which contains one or two seeds. These bear the name of *Quoindah* and from them is produced a rich buttery peculiar sweet thick oil; little of which however finds its way into the open market as the *Quoindah* is bought up by Bunniahs and Muhajuns for the purpose of expressing the oil and adulterating the *ghee* (Buffalo Butter) so largely used in all Indian cookery. I should say from what I can hear and learn that but little *ghee* finds its way into the markets of Benares, Patna and particularly Calcutta; without having been previously more or less adulterated with *Quoindah* (*Mahawah*) oil. It will doubtless when better known, become a valuable article of commerce, but the seed would not keep. The yield of oil from the *Quoindah* is about 33 per cent; and its residue in cake forms food for both men and cattle.

21., *Nimb* (*Melia Azadirachta*) *Nimb*. This is a large

forest tree yielding a wood used for cabinet purpose; and resembling the Toon wood (*Cedrela Toona*.) It produces abundantly small yellow seeds which drop from the tree when ripe. These pulpy fruits contain a kernel:—and are eagerly gathered by the poorer classes. The kernel yields about 25 per cent of bitter impure Oil; which smokes offensively in burning. The Oil is however much valued in native pharmacy as a liniment. I do not know whether this quality is known or valued by European practitioners or no. The kernel would not bear exportation, but the oil might be found useful and its production is only limited by the quantity of the trees planted, which are hardy and grow in any soil.

22. *Chironjee* (*chironja* Sapida.) This is a common forest tree all over the Kymore Range and doubtless in other parts of India. It produces a small sweetish black fruit called *pyar* or *pyal* with a hard kernel. The Hill people dry the fruits and then pound up pulp and kernel in a mortar as required for their bread. The Kernel itself when broken yields the delicacy known so well in the native bazars as *Chironjee* which sells at 1 or 2 seer per Rupee. The taste when parched is agreeable to the European palate and appears something between the pistachio and the almonds. It is rather larger than a grain of barley and each kernel contains two grains. The kernel of the *Chironjee* when the outer nut is removed yields nearly 50 per cent of a delicious and pure oil, but it is seldom met in the market as the kernel itself finds a ready sale as a dessert to be eaten with raisins or alone.

23. I think I have now exhausted my knowledge of this subject. Doubtless there are many more oil bearing plants and trees, but I am unacquainted with them. Other persons will be able to supply the deficiency.

R. W. BINGHAM.

SECTION IV.

Medicinal Substances.

I cannot pretend to much knowledge of these matters, and as erroneous description would be worse than useless:—and no correct description of use or preparation can be had from native practitioners, who are for the most part mere quacks and have no recognized pharmacopea; I have thought it better to confine myself to a mere list of names of Medicinal substances as far as I can learn them, verifying them as far as I can by their scientific names and specifying also, in the same superficial manner, the diseases for which they are used and adding a few remarks when I can speak from personal knowledge. Probably this list in the hands of a medical man might enable him to verify how far these medicines would answer for European practice in which several of them are already known.

2 For Fevers and Febrile symptom.

- | | | |
|-------|--------------------|---|
| I. | <i>Shahtaira</i> | (<i>Oldenlandia biflora</i>) |
| II. | <i>Lasowraqn</i> | (<i>Cordia Myxa</i>) |
| III. | <i>Kashme</i> | (... ..) |
| IV. | <i>Mokoee</i> | (<i>Solanun Nigrum</i>) |
| V. | <i>Melophur</i> | (... ..) |
| VI. | <i>Toolsee</i> | (<i>Ocimum Sanctum</i>) |
| VII. | <i>Kukraoandha</i> | (... ..) |
| VIII. | <i>Patal Nimb</i> | (... ..) |
| IX. | <i>Surphoukha</i> | (... ..) |
| X. | <i>Chiretta</i> | (... ..) This is a well known tonic and febrifuge, and is probably more extensively known, than any other in India. Its properties are well known in Europe also. |
| XI. | <i>Gooreech</i> | (.....) |
| XII. | <i>Kulupnath</i> | (.....) |

XIII. *Semul Kapas* (*Bombax Heptaphyllum*)

XIV. *Kutkarunja* (... ..) This drug is also much used in native Hospitals.

3. *Astringents.*

I. *Nimb* (*Melia azedirachta*) The leaf is much used for poultices in sores or wounds, either cold or hot. A solution of *Nimb* leaves in hot water, and applied as a bath relieves pain—as also does the local applications of *Nimb* seed oil ; which is said to be a valuable application in Rheumatism.

II. *Bill* (*Egle Marmelos*) The wood apple is a most valuable medicine in dysentery—either used in a powdered state :—cut in slices and made into preserve, sucked raw—or *Bell* sherbet. I was cured of a very severe dysentery in a few days by the use of the preserve ; and can confidently recommend it. Its taste is pleasant and I should say would be peculiarly applicable for the dysenteric symptoms and diarrhea of children. Lieut. Pogson* of Simla sells a preparation from the wood apple, which is also used with great success.

III. *Bhang* (*cannabis sativa*) a cooling drink made from a preparation of the leaves of the plant. It produces if drunk to excess a dreamy intoxication, but it is much used by native practitioners as a remedy in dysenteric diseases.

IV. *Anar* (*Pomegranate*) The bark of the *Pomegranate* is a powerful astringent :—and a solution of it is given for worms :—It is also used for other purposes :—while the cooling sherbet prepared from the fruit is particularly grateful in fevers.

V. *Kutch* or *Kuth*. Is a powerful astringent and is prepared in large quantities in the Kymore range. It appears to me that it would be a valuable addition to the resources of European Tanneries for the preparation of Leather.

4. *Pain.*

I. *Sondah Oil*.

II. *Mustard Oil*.

III. *Saouf* (*Anise*)

5. Ointments.

I. *Ghow kooroo* (... ..)

II. *Chahawur* (... ..)

III. *HurHur* (*Cleome Viscosa*)

IV. *Sejarroo* (...)

V. *Ghikuwar* (*Aloe Perfoliata*). The inspissated Juice of this plant yields the aloes drug of commerce.

VI. *Burmee* (... ..)

VII. *Okashawur* (... ..)

VII. *Dhutoorah* (... ..) A sleeping potion of great and deadly efficacy is also prepared from this:—and a preparation of the black *Dhutoorah* is used with a powerful and useful effect in Asthma.

VIII. *Burriarah* (... ..)

6 To cause sneezing.

I. *Snuff*, prepared from tobacco leaves.

II. *Nutchikimnee*. (... ..)

7. Medicines for children.

I. *Aymain* (... ..)

II. *Danna Muroowa* (*Artemisia Vulgaris*.)

III. *Jasutuarree*.

8. *Purgatives*.

I. *Senna*. (... ..)

II. *Black Salt* (... ..) Generally combined with *Senna*, it has an offensive smell and taste.

III. *Amaltas* (*Cania fistula*.) This is a powerful purgative and is much used. The purgative powers reside in the seed vessels:—and I believe a purgative oil, little if at all inferior to croton is expressed from the seed.

9. For digestive powers.

I. *Akhawun* (... ..)

10 Refrigerant Medicines.

I. *Moollee* (*Radish*.)

II. *Khurfa* (*Do*)

III. *Sheeshum leaf* (*Dalbergia Sissoo*.)

IV. *Kheera seed* (*Cucumis Sativus.*)

V. *Kukhuree seed* (*Cucumis Utilissimus.*)

11. Miscellaneous.

I. *Kassaundi* (*Cassia sophora.*)

II. *Sum Babul* (*Mimosa Arabica.*)

III. *Himli* (fruit) (*Tamarundus Indicus.*)

IV. *Dudhi* (*Asclepias rosea.*)

V. *Cabab chinni* (*Piper cubea* or *cubeba.*)

VI. *Peppermint* (*Piper Mentha.*)

VII. *Dhunnyah* (*Corriander.*)

VIII. *Adrak* (*Ginger.*)

and numbers of others which I cannot call to mind. Should this imperfectly prepared list however have pointed out one new drug, which may alleviate one human suffering, or be found a curative or even palliative in any one disease, or be the means of adding one to the many articles of commerce, which this country now supplies to the markets of the world, I shall be satisfied.

12. The list from my want of the proper knowledge must necessarily be imperfect, and a number of germs in particular are omitted :—while I have omitted a number of remedies used by native practitioners which I know to be useless :—and which have only the feeble merit of being harmless ; and it is probable I may have recorded names of drugs which on examination will also be found useless, but as I make no profession of knowledge in the matter :—should such be found, I trust the error will be looked on indulgently :—as no one likes even his ignorance to be laughed at.

R. W. BINGHAM,
Hony. Asst. Magistrate.

SECTION V.

Manufactures.

Shahabad is an almost wholly Agricultural District and in the extended sense of the word possesses no manufactures of importance or at least none which are exported in such quantities as to give it a name as a manufacturing district. I am not certain however whether the quiet nature of its local manufactures may not absorb a larger amount of money than some districts which have pre-eminently obtained the name of manufacturing. It is moreover extremely difficult to obtain any statistics of Indian manufacture: as owing to the system of caste, and hereditary trades and professions, which trades and professions are carried on, not as they are in England or in other civilized countries in large manufacturies or factories, but in the recesses of the private house, and even in the zenanna, and further owing to the system of barter which prevails: and the comparatively small quantity of manufactured goods which are exposed for sale in the Bazaars: it is almost impossible to obtain an even approximate idea of their value.

2. Still by known results we can to a certain extent calculate causes; and in the absence of any other guide these results must be taken as our standard: and I shall take care to avoid any excess in results, so that as a general rule I think 25 per cent might be safely added to all my calculations.

3. Shahabad has few centres of manufacturies, in fact I know of none except *Sasseeram* and *Bubbooh* for carpets. *Suhar* and *Hurriergunge* for paper, and *Chynepore*, *Sasseeram* and *Bubbooh*, with perhaps *Arrah*—for coarse cloth, and *Sasseeram* for woollen and cotton carpets in imitation of the Persian ones.

4. All these manufactures are however family ones and only manufactured as sold, and always sold by a member of the

family which manufactures them, there is no stated mart, but any reasonable amount of goods may be made to order. This involves an extra expence of 10 to 20 per cent, as natives of India know but little or nothing of competition in trade; their favourite plan is combination. Thus if a large demand ensued, the manufacturers would all hope to be suddenly rich, combine and demand high prices, prices which would not be supported by any wholesome trade: and thus inevitably lose the advantage of the demand, verifying the old adage of "grasping at the shadow and losing the substance." They are besides from their family work and connection incapable of any sustained labour, so that they could not be depended upon for any extra work. As a rule they will work for a bare subsistence and when that object is obtained will work for no more. They cannot either be depended upon to the quantity or for the quality of their wares, for whatever their contract, they will always try to pass off inferior articles after their samples have been accepted. Moral honesty they have none; neither have they any trade shame. Having no ambition to rise in the social sphere and being bound down if they had by the trammels of caste, trade honesty, or honor, or ambition to excel is unknown to them; the consequence is that no wise European trader would connect himself with any native manufacturer, and the only safe way to purchase their goods is in the markets after inspection. This of course involves an extra amount of labour and an amount of supervision which charged upon their manufactures would render them unremunerative, otherwise there are many native manufactures which could command a sale in the European markets, and which it will be long ere the superior mode of European manufactures beats out of their own.

5. It is all very well for political economists to argue that India must be the producing and England the manufacturing country, could such a theory be carried out it would undoubtedly tend to the advantage of both countries, but changes which anywhere else on the globe involve at the most, a few

years ; in India involve generations : their trades are hereditary ; and their manufactures only carried on by a certain class from generation to generation, such manufactures only being limited by the number of that class. From their education and training they are incapable of doing any other work. With them their trade is their religion : and no matter how low their trade or profession may be : they neither hope nor wish to rise above it : nor, so long as the present trammols of caste remain, could they do so even if they would. The *Chamar* although Hindoo will eat the flesh of a cow or bullock which has died from disease, and would shrink from killing a cow or bullock for the purpose. The *Mussahir* will catch rats and snakes and eat them. The *Mullah* will eat any thing that swims in the water ; and the lower class of Mussulmen will eat almost any thing that flies, swims or walks provided the *Kalma* or creed has been spoken over its flowing blood. They are not awake at all of their own inconsistencies and close every argument by saying, " Our fathers and grandfathers did this ; how is it possible for us to do otherwise ? " This is the bane of India, and although she has made great progress during our rule : it is in spite of her castes that she has done so—while she would have made tenfold progress if she could only have been persuaded to throw them overboard altogether. Such a consummation is not unlikely in another quarter of a century : if the government will make up their mind to disregard caste in all public employment and in the army ; but while the government, and its officers support caste by only choosing their soldiers and their servants from certain classes, the advocates of the old system have an argument which they do not refrain from using : and the argument being a valid one carries weight with it. I do not hesitate to say that the government by its direct action has fought the battle for caste in India, and is still doing so. The people hate caste, and would gladly be free of its trammels, but they would lose more social distinction under our rule by so doing than they would under the Moham-

medan rule, and the result is that even the Mohammedans of India all go back to caste. They hold the doctrine of the prophet of Mecca, but the *Jalleaha* or weaver, and the *Mehter* or sweeper; the *Hullalkor* or Butcher, the *Nao* or Barber, and various other Mahomedan professors pride themselves as much on their caste as the most orthodox Hindoos do, and transmit their trades and professions from father to son as absolutely as the most rigid Hindoo, while although all Mussulmen will on certain occasions eat in common, they will not eat from the same dish. All this I believe is due to our governmental support of caste: and which only perpetuates the Hindoo system under a new name, and will perpetuate it even if the people become Christian, thus rendering trades, manufactures and professions hereditary: which system while admitting of occasional excellence still binds the professions to a wearisome mediocrity and sameness, stifling invention as innovation and retaining every thing, even trade morals, at the mark of their great grandfather.

6. In a brief notice like this it is impossible to divide the manufactures of Shahabad into classes, and as before said they are mostly of so domestic a nature that but few real results can be obtained by dividing them into heads, but a few notices may be acceptable.

7. *Opium*. This is produced very largely in Shahabad, and is only partially manufactured by the producer, it is *manufactured* properly speaking at the large Government factories of Patna and Ghazeepore, which is then known to commerce as the Benares or Patna Opium. As however not more than four-fifths of the opium produced in the districts finds its way to the Government factories, its remaining one-fifth may be termed a local manufacture:—and it can always be bought under proper precautions at Rs 4 per seer, were it not that the natives of India have no energy:—and there is no loose European population with capital:—the retention of the Government monopoly would be a farce: as smuggling opium to a very large amount could be easily managed:—and the profit would be

certain, while the first to aid it would be the Government native opium officials as they connive at the present illicit sale.

I have no means of knowing the annual value of the Opium produced in Shahabad, but with the allowances I have made such statistics could be easily obtained from the office of the Deputy opium agent of Shahabad:—and would be valuable as showing authoritatively what is the annual value of one of the large manufactures of Shahabad.

8. *Indigo*. This is manufactured in Shahabad to a considerable extent:—and as is usual over all of the rest of India, it is by European energy and capital alone. Native made Indigo has no status in the market: nor have natives who can work much cheaper, been able to compete with Europeans in the manufacture of this article which bears so large a proportion to the value of the exports of Hindostan. The manufacture of Indigo need not be described here, as it is so well known. It is however in Shahabad capable of great extension and improvement and may be described as a third class Indigo i. e. allowing the first place to Bengal:—the 2nd to Tirhoot, and the third to Shahabad, Benares, Juanpore, and Azimghur, while the 5th may be allowed to the Allahabad province and the 6th to Allyghur, Agra, and Delhi. In Shahabad the planter is not exposed to the extreme vicissitudes of Bengal and Tirhoot:—but as a reverse he will never make a sudden fortune. He has however the advantage of not making immense losses. The losses and gains in the manufacture are both less and the production more steady; consequently the position as the planter is more safe. At present Shahabad produces an average of 5,000 factory maunds of Indigo or about 180 Tons of all kinds, which is invariably sent to Calcutta for sale, whence greater part is exported from thence to France, England and America. The average value is about Rs. 150 per maund:—which will give a total for the district of Rs. 7,50,000 or £ 75,000 sterling. This production is

the minimum : the maximum would probably rise to £ 95,000 sterling.

9. *Sugar.* The sugarcane is grown largely in all parts of the district :—and almost every village has its field or fields of *Hookh*. This is sown in April and May by planting one of the knots of the sugarcane in the ground when well prepared for the purpose. Seed is never used which may perhaps account for the continued deterioration of the cane. The canes are generally short, seldom rising more than 5 feet in height and varying from half an inch to one inch in diameter. The ground is always extremely well prepared for sugarcane and no clods are allowed to remain bigger than a hazel nut, while watering until the rain falls is constant and weeding is carefully performed. After the first fall of rain no further care, except fencing is taken with the crop : after that it is never hoed or dug, and I should imagine that a little of the same careful and laborious work undertaken before the rain falls, followed up after them in these essentials would materially improve the yield. This however the naturally indolent native will not do. He will not work if providence will work for him, the consequence is that in the rains much of his crop runs to weed. Still the sugarcane is considered by the villagers to be an extremely paying crop, and but little encouragement would be needed to extend the cultivation tenfold. The cutting of the cane is commenced towards the close of December, and continues until February, while each field has its own rude crushing mill much like the oil seed crushing mill described in a previous section, (and illustrated by a model.) The juice of the cane after expression is carried to the rude earthen furnaces, and transferred from one baking pan to another, and is thus gradually worked into *Goor* (or sugar and Molasses combined) in square lumps averaging about 30 lb weight : which is sold to the sugar refiners at from 24 to 36lb per Rupee. These sugar refineries are common all over the district but being altogether in the hands

of natives but few results can be obtained. The sugar produced is however exported as I learn in considerable quantities while still larger quantities are required for local consumption. I have no data from which to calculate the actual production. The sugar prepared is well known in the market as Patna and Ghazeepore sugar, and finds its way to England under the name of "East India"—It is white and clean, but not crystalized, the native manufacture apparently not admitting of that operation, though the native candies crystalize admirably.

10. *Cotton or Calico manufactures* are almost wholly for local consumption. I do not believe any are prepared for export, and although to a superficial observer the amounts of native manufactures would appear to be almost *nil*; still to those who know the people and their domestic economy and to whom the aggregate amount of consumption is known, that fact enables them to furnish statistics which will perhaps be looked upon as extravagant. Those which I shall furnish are however not so, whatever they may appear to be:—and will fully admit of the allowance I have mentioned in a former section.

11. At least six-tenths of the whole population of Shahabad are clothed in wholly native and local manufactures:—these are the purely labouring proportion;—two-tenths of the remainder may be called the middle class and are half clothed in native manufacture, while the remaining two-tenths consisting as they do of the higher classes, court Omlah, Police, Merchants, and classes brought into daily contact with the Europeans may be clothed eight-tenths of their consumption in English manufactures.

12. Shahabad contains a trifle over 4,400 square miles and we shall be allowing (considering the district and allowing for its southern Hills) of a very low amount of population if we assume its total population to average 220 per square mile of surface. It has few towns of any consequence or

would much exceed this, and probably does so, as many parts are densely peopled, but taking that amount as the basis of calculation, we have a population over the whole area of 968,000 people, or for convenience say of 1,000,000. This is far under the mark but will serve to illustrate my position.

13. Out of this 1,000,000 people, 600 thousand as above said are wholly clothed in native manufactures and generally wear Dhotees and Chudder, the lowest amount of clothing they will consume is 15 yards each yearly. This gives us 9,000,000 of yards.

14. The second class of two-tenths or 200,000 comprises the well to do Zemindars and the better class of ryots whose expenditure will be about 40 yards each yearly of which 20 yards will be country or local manufacture; this 20 yards will give a total of 4,000,000 of yards.

15. If we also allow 20 yards as the average consumption of the remaining two-tenths of the people i. e., 4,000,000 of yards more:—and that this is far under their mark (as they use native cloth for floor and ceiling cloths for the covering of their matrasses and for numberless other purposes), will be self evident to any one acquainted with the class spoken of; we have then the apparent enormous consumption in Shahabad alone of local manufactures of seventeen millions of yards of country manufactures of which the greater portion might be replaced by the looms of Manchester:—and which now only holds its place in the local market by the want of good roads, by the consequent expence of carriage of bulky goods and by the system of barter which is the foundation of all native local trade. Local goods may be purchased by barter, while European goods require cash payment:—a mode not yet understood in the interior.

16. There are four kinds of cotton goods commonly made by the native weavers, who also make occasionally other and finer qualities, but these four are their staples and are

sufficient for the purposes of illustration. Sasseeram weavers i. e., properly speaking two or three families of them, make a fine striped fabric which is eagerly bought for Pyjama's and for female dresses, by the Mussulman population, but as it is not always to be had it can scarcely be reckoned as a standard manufacture; when it is however in the market it competes fairly with European goods as it is light, strong, and serviceable. The four kinds in most general use are as follows :

I. Pieces of 16 yards in length of a coarse fabric, something coarser and heavier than the "grey shirtings" of Manchester and called "*barra girrea*." This is as its name implies 12 *girrahs* or two feet broad, and is used for the clothes of children, it is sold at Rs. 1-12-0 to 2 rupees per piece.

II. Pieces of 16 yards in length of a similar fabric but from 2 feet 9 inches to 3 feet in breadth; and often divided by two inches of unwoven cloth into four pieces are sold for dhoties or waist cloths. These are for men divided into 4 and 5 yard pieces and for women into pieces of six yards each. The pieces of 15 to 17 yards sell at from Rs. 2-8-0 to 2-10-0. This is called *Dhoteeah*.

III. Other pieces of 16 yards of a coarser fabric are manufactured and called *guzzee*. It is used by the very poor; and for domestic purposes: its breadth is almost 1½ feet and length 16 yards; and price from fifteen annas to one rupee per piece.

IV. Another finer kind, which is only manufactured by practised workmen, and who are almost always Mahomedan, is the description known as *Puggree* or turban. It is almost invariably used as an head dress by the better classes in Eastern India and varies from the character of a coarse muslin to a fine gauze-like texture:—with or without tinsel thread as decoration let into the ends above the fringes. The coarser kind are called *fehnteh* and the better

kind *puggre*. Its breadth is from 10 inches to 1 foot and its length varies from 18 to 24 yards, while in price it varies from 12 annas to 2 rupees, and of course in the case of embroidered turbans often reaches a much higher sum according to the amount and value of the embroidery work expended upon it.

V. There is another kind of coarse cloth manufactured known as *Khassa* or fine: because I suppose of its flimsiness. It is made in pieces of 16 to 18 yards each: and in breadth of about $2\frac{1}{2}$ feet. It is used generally for the dyed clothes of women, for straining cloths and other purposes of a similar nature, and fetches in the market a price of Rs. 1-2-0 to Rs. 1-6-0 per piece.

17. I have thus enumerated the principal native calico manufactures:—any others made: (and as I have before said, there are others of local celebrity) are only of limited sale and application. The above are however manufactured in almost every village more or less: and principally from local cotton: any deficiency in which is made up from the markets of Ghazee-pore, Mirzapore and Benares. If we assume my previous calculation of 17,000,000, (seventeen millions of yards) to be almost the average local consumption, and I think that is under the mark; and allowing the average price to be 2 annas per yard, (and that it will be seen is low), as the principal expenditure is for dhotees and women's chudders from No. I. and II. we have total value of local calico manufacture in Shahabad of twenty one lacks and twenty five thousand rupees per annum or the large sum of £ 212,500 sterling per annum.

18. *Carpets*. These are made wholly of cotton and almost invariably striped. From being made of cotton they are cool and pleasant, and are in invariable use by the better class of natives and by all Europeans. The smaller kinds are used as a quilt for beds; and of late the government has given them to its European soldiers for that purpose.

The manufacturers, called in this district *Kalteem Bap* are almost invariably Mussulmen of the weaver class:—who will make carpets of any size and pattern given in stuffs. The two local seats of manufacture in Shahabad are Bub-booh and Sasseeram. In the former place from Rs. 10,000 to 12,000 are yearly manufactured and sold; and in the latter from Rs 30, to 40,000. These *durries* or carpets are sold readily in all the bazaars around, and at all the neighbouring fairs, particularly at Berhampore, and *Hurrier-Chuttur* or Sonapore, probably $\frac{3}{4}$ of the whole quantity made are exported from the district:—while the annual expenditure in the district will vary from Rs. 20 to Rs. 25,000 worth per annum.

19. The *Durries* or carpets generally made for sale are the following.

I. 6 yards long and 2 yards broad; thick and strong, of any colours sold at from Rs. 6 to Rs. 6-8 each.

II. A small kind used as quilts or to spread in lieu of any other bedding on the ground. They weigh from 2 to 3 lbs each and are $1\frac{1}{4}$ yards to $1\frac{1}{2}$ yards broad by about 2 yards long, they sell at from 14 annas to 1 Rupee 8 annas each according to thickness and quality. (The specimen accompanying is 14 annas only.)

III. *Houj Hassiah*. This is the better kind of carpet; and often displays much taste in the arrangement of the striped colours. It is made of any size to fit any room and is always sold by weight. The price varies according to quality from Rs. 1-4-0 to Rs. 1-12-0 and sometimes as high as Rs. 2-4-0 per seer. It is sold in all the fairs and in all the large cities around such as Patna, Ghazeepore, Daudnuggur, Gya, &c. and no merchant's or Banker's shop and no rich native's reception room is complete without one of these being spread. This is the kind generally used by Europeans for their dining and public rooms.

IV. Is a small kind of carpet made for use in Zemin-

dary and other small *cucherrees* and much used from its portability. It is from 3 to 4 yards long and from $1\frac{1}{2}$ to 2 yards broad, and sells at from 3 to 4 Rs. each. It is generally made from 5 colours from which cause it obtains the name of *Durrie Pauch Rungha*.

20. Any other descriptions wanted are made, but these are the principal in use. The supply of these articles is only limited by the local demand. I am of opinion that in this manufacture Manchester might step in with great advantage;—and by copying and improving on the native patterns command a very large sale indeed. If Manchester would make these articles in long webs and in all widths and patterns, she would be certain to drive the native manufacturer from the market to other trades, while commanding a valuable trade all over India for herself: while the superior stiffness, thickness and quality of Manchester goods, would as in the matter of her calicoes and cottons surely but slowly supersede the native manufacture; but to do so, it is important to work native patterns, the natives are a people of routine even in their carpets and would not patronize sudden changes in the patterns and colours to which they had been used from childhood, but there yet exists abundant ground for innovation and for Manchester to improve on the established native patterns, as Europeans, (and they would probably consume $\frac{1}{3}$ of the supply) would be glad to have some other than the monotonous stripes of native manufacture; and as other patterns came in use among them they would slowly but surely find their way among the native population.

21. *Gulleechas* or carpet. These are only manufactured in Sasseram, and are almost always woollen of florid but neat patterns in imitation of the Persian carpets. They are used to a considerable extent by the rich natives in their Zenanas and by Europeans also. The size usually manufactured is 2 yards long by one yard broad and sells at from

Rs. 2 to Rs. 4-8 per carpet. Any other sizes and patterns can be made according to order, and some of the patterns are extremely pretty. The European carpet manufacturers could not compete with them as to price and actual value, as the wool costs but little, and the native dyes answer admirably for the purpose. The colours are harmonious and I have but little doubt that it would pay any enterprising merchant to export them to Europe. The annual manufacture at present in Sasseram is about Rs. 10 to Rs. 12000 Rupees.

II. Another kind in imitation of the above but wholly of cotton is also made, prices nearly the same. The patterns are pretty, but they rapidly become spoiled by dirt and dust. They are invariably made of only two colours blue and white.

22. *Paper* of a coarse kind is made from hemp and other cognate substances in large quantities at *Suhar and Nasreegunge* on the Soane, and large quantities of it are exported to the surrounding districts. This manufacture is wholly in the hands of Mussulmen and I do not think it is capable or worthy of extension. It has certainly received no improvement for the past two hundred years, and will speedily be beaten out of the market by the Serampore, European and American cheap papers. One thing however is perhaps worthy of notice. . Being a paper manufacturing place of great local notoriety, it would doubtless be an admirable site for some European firm to commence a paper manufactory; as the workmen trained in a great measure to the processes are at hand and the materials from which papers of all kinds are made have here found a centre: a good paper manufactory would be sure to pay, and the suggestion is I think worth the attention of the trade.

23. Many minor manufactures doubtless exist in the district. Sasseram for instance produces Soap and Glue of great local celebrity and is also a large depot for the manu-

facture of shoes and boots for the Calcutta and the Mauritius markets. Chynepore is famous for its fine yarns and cottons. Jugdeespore used to be famous for its arms, and Sasseram used to make daggers and knives: but I think I have mentioned and described all the main manufactures of the district. I am aware my description must in many cases have been imperfect; but I trust the will will be taken for the deed. I will now close these remarks hoping that at least I may have given the ground work upon which some closer observer may furnish more accurate facts.

I have &c.

R. W. BINGHAM.

P. S.—I trust the models of “Iron smelting furnace” and “Oil seed crushing mill” reached you safely.

R. W. B.

Reports on Tea Cultivation for Season 1861-62, in Assam, Cachar, Darjeeling, and Sylhet, received from the Board of Revenue.

Assam.

From MAJOR WILLIAM AGNEW,

Offg. for Commissioner of Revenue, Assam.

To H. BELL, Esq.

Under-Secretary to the Govt. of Bengal,

Fort William.

SIR,—I have the honor to submit the Report called for in your letter No. 728 dated the 16th Instant, and in doing so to apologize for its not having gone in at a much earlier date, but the multifarious duties that have devolved on me since Major Hopkinson went away occupy me so incessantly that I find it very hard to preserve that punctuality in my correspondence I should wish to do.

I am sorry I must premise my report by candidly pronouncing it to be of little value, owing to the defective materials I have got to prepare it from. For instance, to take a few of the first errors that present themselves, several plantations are left out of the Kamroop statement altogether. Again the Assam Company's plantation of Singri in Durrung was shewn last year as having had in 1860 one hundred and twenty acres of cultivation, while this year it is returned as then having had only 25 acres cultivated. In like manner Mr. Bruce, in the same district, returned his cultivation last year at 30 Acres for 1860, while now he shows he had not begun cultivating that year at all. Then again in many instances information is withheld altogether.—For example, the total area under cultivation in Nowgong was given in last year's report from that district as 1685 acres; for this years' report it appears the planters have only returned 155 acres as the amount of their cultivation in 1860, and they only give 797 acres for last year; in other words the returns show that in the Nowgong district cultivation has fallen off from sixteen hundred and eighty-five acres in 1860, to seven hundred and ninety seven in 1861, whereas in point of fact it has increased probably one fourth. It will be seen then how valueless a report must be compiled from such imperfect data. Although the Planters are probably not over communicative about their affairs, Deputy Commissioners are not altogether blameless for the imperfectness of the returns submitted. They know, at all events, what lands have been taken up and the area thereof, and in those points their reports should be complete, but neither the Kamroop nor Nowgong reports are so. I shall bring this matter to Major Haughtons' notice and recommend him to take steps to ensure greater correctness next year.

2nd. The returns show that there were at the end of 1861 one hundred and sixty plantations altogether held by sixty

two Companies and individuals. Four of the former are public bodies, namely the Assam Company, with twenty four plantations in Seeksagur, Luckimpore and Durrung: the Jorehauth with two in Nowgong: the East India, with seven in Seeksagur: and the Lower Assam with one in Kamroop. The Central Assam Company, whose advertisements have been so conspicuous in the papers for some time past, has not concluded the purchase of its lands yet I believe.

3rd. There are fifteen private Companies. Nine in Luckimpore holding nineteen plantations: three in Seeksagur holding five: one in Tezpore holding four: one in Kamroop holding two: and one in Nowgong holding one. The rest are in the hands of private parties, seventeen of whom are natives. The only natives shown in the statement as cultivators are in the Seeksagur and Luckimpore districts; but besides those there is a small joint stock Company who have planted a few Bighas in Gowlparah, and one or two individuals are trying the cultivation in a small way in Kamroop also. I shall watch with interest the further development of native enterprise in this direction.

4th. The statements submitted to me show that up to the close of last year, the area taken up for tea cultivation in the Province amounted to 71,218½ acres, but this is clearly not correct, for the quantity shown in last year's report was considerably in excess of that mentioned. 13,222½ acres are said to be now under cultivation. I here pause to observe that through an office error in addition, Major Hopkinson was made to report last year that there were 20,945 acres cultivated at the time he wrote, whereas the quantity should have been 12,045 acres.

5th. Taking those then as the correct figures it will be seen that there has been an increase of 1,177½ acres in the cultivation during the year 1861. But 13,222½ acres, does not nearly represent the cultivated area, for many proprietors

as I have before noticed, especially those in the Nowgong district, have not made any return of their present cultivation, which I have no doubt amounts to at least 16,000 acres in all.

6th. It appears from last year's report that the estimated outturn of the tea crop for 1860, was 17,05,130lbs, but this year's returns shew the actual yield to have been only 14,90,872½lbs or 2,13,605½ less than was expected. In Nowgong district however two concerns that estimated between them for 90,800lbs have not given any return at all of their yield. Again the Singri concern in Durrung estimated for 32,000lbs, which must either have been a clerical error or facetiousness on the part of the then manager, for the outturn was only, it seems, 4,000lbs, so that the figures above quoted do not represent any thing like what the actual yield was. The outturn from the present season's operations is estimated at 17,88,737lbs or 2,97,864½ over last season's yield, and the crop throughout the Province will probably be fully that or more, as many managers have not furnished us with any estimate at all.

7. The number of laborers engaged in the several plantations is 16,611, of whom nearly one half are employed in Seeksagur; but while there has been an increase during the year under review in the other four tea growing districts in the number of laborers working on tea lands, in Seeksagur very considerable falling off appears. The returns do not distinguish between imported and local labor, and I find no statistical information, I regret to say, in this office regarding the extent to which coolie emigration has been carried. I have however great satisfaction in saying that the frightful mortality that used to prevail amongst the coolies on their way to Assam, reaching on one occasion it is said to 50 per-cent, has diminished; for instance out of four gangs sent to Dibrooghur, in December, February, April and May last, amounting in all to 277 persons, only four deaths from disease occurred, which shows undoubtedly that more care and

kindly consideration is now being shewn towards these poor people than was formerly done.

8. The Revd. Mr. Higgs of Dibroogurh observes on this subject.

"With the exception of the first gang the whole of the coolies were procured by Messrs. Barry Smith & Co. of Calcutta, and having careful medical inspection, and at the last hour even, any shewing symptoms of disease, were put on shore and healthy men substituted.

"The boats (flats) in which they came were not over crowded, and the usual bad custom of washing down decks, where the coolies lived, every day, was not adhered to. Instead of this at every station the whole of the coolies were sent ashore, and their place of living thoroughly scoured out, and purified with chloride of lime, and then allowed to become perfectly dry before the coolies were admitted.

"The old practice of washing down decks every day, no matter what the weather, and leaving the coolies to live in the wet and muck was bad, though on the surface it might appear a very cleanly practice. All gangs of coolies might be as successfully landed at Dibrooghur, as the four I have cited from my own knowledge, if the simple precautions thus adopted were always observed: that is, careful selection, and medical inspection at the last moment before leaving,

* A good blanket served proper clothing* and good and wholesome food and water, and above all attention on board the steamers to the

real comfort and cleanliness of the emigrants.

"An immigrant agent, appointed by Government* and re-

* The Planters and others procuring immigrants would bear the expence of the agency by these necessary conditions; and it would not be difficult to induce or

grant. compel the commanders of steamers effectually to attend to the other.

“ I think I have only to add to this, that all the coolies of the gangs I have mentioned, have been remarkably healthy since their arrival, and on the whole contented and well behaved.

“ I have remarked, that in the case of gangs where great mortality has occurred in the passage up, discontent, bad behaviour, and frequent desertion have almost invariably followed.”

9. The committee now sitting in Calcutta to enquire into the system of emigration to the tea districts will doubtlessly put Government in possession of such facts regarding the subject as will lead to proper measures being taken to ensure emigrants the protection they stand in need of.

I have &c.

GOWHATTY :
3rd July, 1862.

(Signed,) W. AGNEW,
Off. Commr. of Revenue.

Cachar.

Extract from a letter from the Officiating Commissioner of Dacca to the Secretary to the Board of Revenue Lower Provinces, dated 14th June. 1862. No, 55.

“ The cultivation of Tea is steadily and swiftly progressing in Cachar. At the time of my last Report there were but 52 European Inhabitants in the District ; on the 1st of May 1862 there were 110 most of whom are Tea Planters. I am sorry I am not able to give detailed statistics of the area under cultivation, or of the amount produced, as there appears to be in some concerns a jealousy regarding making these particulars public : but judging from the estimates framed last year, and which have every chance of being realized, I should say that, not less than ten lakhs of Rupees worth of Tea will leave Cachar this present season. These results are most satisfactory in every way, as this is only the close of the

fifth year since Tea planting was introduced into the District. They shew at once the energetic spirit of the planters which have made impenetrable Jungles and forests richly remunerative; and also the fostering and liberal policy of the Government which has spread out this field on such advantageous terms."

"I have before had occasion to remark that at first the natives of the District looked upon the liberal grant of lands to European Tea Planters, with jealousy, as they themselves when they had to settle waste lands for their own cultivation, had to pay at much higher rates and for much shorter terms of lease. Much of this feeling has now passed away, and it only exists when the native Merasdars and the European Planters are applicants for the same piece of land, when if decreed to the one or the other, there is such considerable difference in the Jummah demanded. The planter in taking up remote localities is looked upon by the natives as a general benefactor, and this will be easily understood when it is shewn that, in such a small province as this, the Tea planters monthly expend about Rupees 50,000 to laborers. It is true that, most of the laborers are imported, but as they subsist upon the products of the country, the most part of the sum is divided among the native inhabitants."

"Then again it must be considered that the present export of ten lakhs worth of Tea is but the first fruits of a cultivation yet in its infancy; it will be doubled next year, and for several years to come will go on doubling in geometric proportion, as no plantation is in full bearing till its fifth year, few having yet attained that age; and as the yield goes on doubling from year to year until at that age, and as the number of young plantations far exceeds that of old ones."

"This successful state of things would appear to justify the proverb "Let well alone;" but there is a point upon which, as I have before stated, I think Government inter-

ference necessary. The whole of the future success of Tea planting in Cachar rests upon the import of labor into the Province. The local labor is totally insufficient, and even now in the present state of the cultivation upwards of 5,000 coolies from the Western Provinces have been imported. Nay, many more than 5,000 ;—there must be 5,000 now at work on the Plantations, not counting the numbers who have died and absconded, and these form no inconsiderable part of those that have left their homes. Let it be considered that, if now 5,000 of such men are at work, it will be absolutely necessary to have 20,000 when all the lands now under Tea cultivation shall be in full bearing, and then let us think of the system in force for obtaining this emigration. There is no system at all. The planter simply offers to certain agents down below so much a head for each cooly that is despatched, and coolies are despatched in all states and stages of disease, maimed even, blind even, lame even,—even utterly incapable of labor are sent up, and are sent up, there is not the slightest doubt, under false personation. Those that are hale among them abscond during the passage up in numbers. Nay, appeal to Magistrates on their way and are released, as no documents of Contract accompany those who are in charge of them. The mortality among coolies so cramped on their voyage up is, as may be fancied, very large, and disheartens those who come up with a fixed intent and full understanding ; and even these abscond in great numbers, at great loss to the planters, and filling the courts with cases of breaches of contract.”

“ Of the agents employed down below some are Natives and some Europeans. The contracts entered into by them with coolies are sometimes simply signed by them as being done in their presence, crosses being put for the names of the coolies ; at other times the signatures are purported to be before witnesses, but none that I have seen are executed before a Magistrate or notary public. The European agents

may be under the impression that they are witnessing *bouafide* bonds for service; but that in some cases they do not, has become patent to me: they must in their turn employ Native agents to hunt up emigrants for them, and these retain a body of able men to come before the European agent as prepared to go to Cachar, who sign crosses before the European agent to certain names there written down, while others, also bearing those names, are actually sent up."

"With reference to the treatment that these coolies receive after arrival in Cachar I may safely state myself, as being competent to judge, there is hardly a plantation that I have not personally visited during the past year, and in every one I have remarked the greatest possible consideration paid to them. There are houses built for them as comfortable as the lines of any native troops I have ever seen in India. Hospitals erected for the sick, and food supplied at the cheapest rate, the labor expected being in every case moderate, many doing twice the amount and receiving double wages. But here again the defect of the system of emigration which sends incapable men into the district is perceived. A maimed man, or a blind man, or a diseased man has been entrapped to come up to Cachar. He is as willing to leave it as the Planter, to whom he has come up, is to get rid of him, and the contract is absolved and the poor wretch has to find his way home, in many cases dying before he reaches the station, or on his way thence to his native place."

"These evils might be prevented were a system of registration of contracts introduced, where they are made; the agents being obliged to produce the coolies who sign before the magistrate of the district whence they emigrate, or before an emigration agent in Calcutta. As they are sent off, advices of their despatch might also be sent up to Cachar, to the Magistrates as well as to the Planter to whom they are consigned, to ensure their good treatment on the voyage and reception on arrival. Some such system seems to me

absolutely necessary as well for the interests of Tea Planters as in humanity to the coolie."

The cultivation of Tea appears to be progressing very rapidly, and the produce of the several Tea gardens promises in a few years more to form a great branch of the trade of the Province. The Superintendent's remarks regarding the emigration of coolies are well deserving the attention of the Board of Revenue.

Darjeeling.

From H. C. WAKE ESQUIRE, C. B.

Superintendent, Darjeeling.

To THE UNDER SECRETARY TO THE GOVERNMENT OF BENGAL.

Fort William.

SIR,—With reference to your letter No. 729 of 16 June last I have the honor to submit the required report. I regret that there has been so much delay in doing so, but I have been unable till now to obtain the necessary information from the planters, and, even now the report will be imperfect from the scanty information they have afforded me. Still enough is given to give a good idea of the rising prosperity, and increased Cultivation of these hills and its prospects in future,—when the issue of the new rules will enable me to dispose of the lands applied for, which includes every cultivable acre in the district.—

2. You will perceive that the land planted last year amounted to 3,251 acres, and this year to 5152½, shewing an increase of 1901½, while the land cleared and either cultivated or ready for planting amounts to 8767½ acres.—

3. The quantity of manufactured tea last year was 27,983 lbs, and that of the present year will probably be 78,244 lbs in 1862.—

4. Some of the above cultivation is coffee, but the proportion is small and decreasing, it being found not to pay at

any higher Elevation than 1500 feet: quantity made last year 8200 lbs—and this year 2460 lbs—decrease 5740 lbs. .

5. The Coolies employed last year were 2534, this year 4819—increase 2285. Of the number employed about 4000 appear to be Nepalese, 298 Lepchas and Bhotias, and 521 plains men. As the planters in several instances have not given the respective number of each, this is obliged to be guess work but is pretty correct.—

6. The returns give the general health as good, though there has been a good deal of small pox especially among the lowest lying plantations; in one of these, Mr. Fitzgerald's, it has caused great havoc. This is a subject calling for special attention. The practice of inoculation to which the Nepalese and hillmen obstinately adhere causes the disease to spread with frightful rapidity. The person inoculated rarely if ever dies of the disease, but he communicates it in every direction: on the other hand they have got an idea, whether with any truth or not I cannot say, that of the few cases in which they have resorted to vaccination, there have been a large proportion of fatal cases occurring afterwards. Considering the ravages made by this disease, in the district,—one of the chief causes of the difficulty we experience in inducing emigration of the laboring classes,—I think that extraordinary measures are called for. A staff of Nepalese vaccinators should be trained under the Civil Surgeon and distributed over the district, and the practice of inoculation should be severely punished. Indeed section 270 of the penal code provides for the punishment of any person likely to spread the infection of any disease dangerous to life, but till the people generally are made to understand this, punishment would be hard. For this reason, I, some little time ago, issued a proclamation to this effect, and in consequence a deputation of Napalese sirdars waited on me, begging that I would either allow inoculation under sanitary restriction, or appoint one of their countrymen as vaccinator.

7. The Coolies appear happy and contented; only one gentleman complains of the loss of large numbers of his laborers owing to the raised wages of the Executive Engineer department. That such has been the case on his plantation is a fact but it is owing to its position, low down far from any market or thoroughfare.—

8. At first the rise in wages alluded to certainly caused a few cases of desertion, but as I invariably apprehended, and sent back the deserters who had left without legal notice, it ceased and I have lately had no complaints.

9. When the comfort and health of the coolies is looked to by the planter they generally prefer plantation labor to that of the Cart road.—

10. The causes which prevent the superior comfort of the 1st. kind of labor telling are remoteness from thoroughfares and markets and an occasional panic from small pox, and doubtless in some cases bad management and injudicious assets.*—

11. In conclusion I must remark that it would be well if immediate possession could be given to those amongst the registered applicants for land who are willing to bind themselves to any terms Government may afterwards determine to impose. Of these, there are many persons who have already invested largely in seed, which I am given to understand will not keep long, and are willing to take land on the old rules at 10 Rupees or any terms that shall be afterwards fixed on.—

12. I would strongly urge on the Government some concession of this sort. Much disappointment has been caused by the delay in the issue of the rules which no one had any reason to expect, and, no doubt great loss has already been suffered by individuals. The sowing season has indeed already passed, but transplanting from nurseries can go on till October and immediate possession would be considered a great boon.—

13. With regard to general trade there is little to be said,

little or no commerce existing except in articles of consumption for the stations. Were a good road communicating with Thibet, through Sikim constructed, trade from the above country would doubtless flow freely into our territories, and the inhabitants would also probably resort to the Darjeeling market for tea.—

Para. 13. of the Treaty with Sikim of March 1861, provides for the construction of such a road, binding the Moharaja to afford protection and security to those engaged in the work and to maintain in good order the road when completed, erecting places of shelter for travellers. The importance of such a road must be patent to the Government.—

I have &c.,

DARJEELING: (Sd.) H. C. WAKE,

Dated the 16th, July 1862. Superintendent Darjeeling.

Note by the Committee of papers.

The Committee regret the very imperfect state of the returns, of the extent of cultivation and production of tea, given in the foregoing papers; still as they contain much interesting information they are published as received. As it will be desirable to obtain reliable returns from which to prepare a correct statement for publication in a future number of the Journal, the Committee take this opportunity of inviting the proprietors and managers of Tea Plantations to forward correct statements to the Secretary of the Society for that purpose.

Sylhet.

From S. H. C. TAYLER, Esq.

Collector of Sylhet.

To THE COMMISSIONER OF REVENUE.

Dacca.

SIR,—In answer to the Board's letter No. 241 of the 24th ultimo, forwarded with your office memo. No. 86 of the 27th

TO FACE PAGE 376.

Statement shewing the operations of the Tea and Coffee P

1861.	Manufactured amount.		Anticipated amount of planted land in 1862.	Probable yield in 1862.	
Coffee.	Tea.	Coffee.		Tea.	Coffee.
lbs.	lbs.	lbs.	acres.	lbs.	lbs.
"	2,014	"	300	6,000	"
"	2,706	"	800	12,300	"
"	"	"	80	"	"
"	"	"	100	"	"
"	"	"	50	"	"
"	"	"	30	"	"
"	"	"	30	"	"
"	"	"	30	"	"
"	"	"	10	"	"
"	"	"	500	1,312	"

Idem, I have the honor to make the following remarks. From enquiries made it would appear as follows :—

Mr. C. B. Jennings states “ he has but one grant settled “ on him, the extent of which is about 1,150 acres, out of “ which he has cultivated about 160 acres, and would have “ had much more, but was disappointed in getting seed last “ season ; he had no crop off his plantation last year as the “ bushes being too young to pick leaf from. The cultivation “ of this year considerably exceeds that of last ; no steps to- “ wards clearing the remaining portion of the grant appear “ to have been made ; no profit was received last year from “ this plantation, some little is however looked for in this.”

Mr. M. Samuell, manager, Sylhet East India Com-
pany, states, “ That he has under cultivation 100 acres of “ the plantation (Tillaghur) under his charge. About 20 “ acres only yield ; last year no crops were obtained. “ The cultivation of this year has exceeded that of last by “ about 60 acres, he states no steps can at this season of “ the year be actually taken for bringing uncultivated land “ into cultivation ; but after the rains (in October,) steps “ will at once be taken to bring, it is hoped, 200 additional “ acres under cultivation. It cannot be said that there are “ profits this year ; as compared with the past year there is “ an improvement, as tea is being made on the estate for the “ first time, but the sale of the outturn will not more than “ cover the expences of one working month.”

Mr. W. G. Howard, Sylhet and Cachar Tea Company Li-
mited states:

“ The only grants in Sylhet owned by this Company are “ Lullee Cherra grant, the puttah for which I have sup- “ posed to be 2,500 acres ; and a grant adjoining the north- “ ern portion of Lullee Cherra applied for July 9th 1861, “ surveyed, possession given by F. Davis Esq. Collector, the “ puttah for which not yet come to hand, the grant is said to “ contain 1,000 acres. I was obliged to open and plant a

“portion of this grant this year, without awaiting for the
 “puttah, as the heavy jungle therein coming very close to the
 “station of Ottargatch caused the place to be unhealthy. Of
 “this 3,500 acres, there is now planted or ready to plant
 “about 800 acres, about 25 acres of which are on the new
 “grant. About 12,000^{lb} of Tea are made in the season of
 “1861 that is from March 24th to April 31st. Last year but
 “62 acres planted, this year there has been cleared for
 “planting 450 acres. These figures do not include land
 “cleared unfit for planting and used for hutting sites.”

“My instructions have not yet arrived as to what quantity
 “of land is to be cleared the coming cold weather, but I have
 “suggested 400 acres which will I think be ordered: about
 “that figure will probably be planted yearly until all the land
 “available for tea, say 1,000 or 2,000 acres be planted.”

“It is impossible to tell as the Tea season is not half over;
 “the increase of yield of Tea this year over last will be
 “about 80 per cent.”

Mr. Oswin Weynton Sylhet Tea Company limited states.
 “The Sylhet Tea Company’s plantations consisted of 314
 “English acres under plant, out of the original grant of
 “1566 acres obtained by this Company in March 1860.

“The Growth of the Tea plant and produce of leaf up to
 “April 30th have been very satisfactory.

“More land has been brought under cultivation this year
 “than any former years since the Company have been at
 “work in Sylhet.

“As much land as considered necessary will be brought
 “under cultivation next cold season, probably between 100
 “and 200 English acres.”

“No profits have yet been derived from the Company’s
 “plantations, the age of the plants not admitting of any
 “considerable quantity of Tea being made from them.”

It appears that the trade of the district has been to some
 extent reduced during this last year. The fact is, I con-

ceive attributable in the first place to the disturbances in the Frontier, which have tended to put an almost entire stop to the export and import of different articles of merchandize from the Hills to the plains, and vice versa.

The price of rice, paddy, &c equals that of other Districts, hence, their import and export have likewise in a measure discontinued. The small pox and cholera which visited this district in one of their worst epidemic forms have helped greatly to bring about this state of things.

Linseed, Radish and mustard crops were not good this year, and the price of Limestone having decreased, the Mahajuns have, I believe, suffered greatly, and the trade has been to a great extent abandoned.

I have &c.,

COLLECTOR'S OFFICE SYLHET :

S. H. C. TAYLER,

The 24th July, 1862.

Collector.

Sketch of the Flora of the Country passed through by the Expeditionary Force under Brigadier General CHAMBERLAIN, 17th April to 19th May 1860.

(Forwarded to the Agri-Horticultural Society by the Govt. of India.)

PREVIOUS to the end of last year, the tract of country including our Trans-Indus Territory and the mountains to the west of it, i. e., from Peshawur to Mittunkote, and from the Indus to Ghuznee, was a *terra incognita* to Botanists.

On all sides of this space, circumstances had enabled more or less to be done to elucidate the Flora, but the district I allude to, would, in a Botanical chart, have been almost a perfect blank.

In these circumstances, and especially in these days when access to an "unexplored district" that acme of delight for the pursuer of any branch of natural science, is so rare, I might well be gratified, at having it in my power,

through the kindness of Brigadier General Chamberlain, to accompany the 1st and 2nd Wuzeree Expeditions, and thus to do what in me lay, and what circumstances might permit, to help to fill in some few of the details in this blank.

I may premise that, botanically, the exploration of any part of this tract would be most interesting, from the fact of its tending to shew the relative distribution of plants of Persian and Indian Floras which lie to either side of it, and this even, although the country might be arid and stony, and the Flora numerically a poor one.

The 1st Expedition was necessarily undertaken in the "dead of winter," and without the supplement of the 2nd, its botanical results would have been of comparatively trifling value, as of course many of the specimens collected during the former, consisted merely of a scrap or a few leaves. In this sketch therefore, I shall confine myself almost entirely to remarks on the Flora of the country of the Buttunies, and Mahsood and Momeetzaie Wuzerees, which the 2nd Expeditionary Force passed through in its progress from Tank, the place of rendezvous, up the ravine of the Zam stream, to Kanugurm, and thence down the Khyssore towards Bunnou, when it broke up; and shall adopt a modified "diary" form as perhaps the best suited to my purpose.

The city of Tauk, near which the Force assembled, is situated in an oasis of Date-trees and surrounded by cultivation (chiefly of barley and beardless wheat) which looks very refreshing after the very dry and dusty country on either sides of the southern front of the Trans-Indus Salt-Range, through which our road had lain.—Irrigation is accomplished by means of cuts from a Canal from (I believe) the Zam, a stream which issues from the Buttumni Hills, a few miles to the west.

The only large trees besides the Date-Palm, were ficus Dalbergias (*Shisham* Punjabi, *Shewa* Pushtu,) along the

margins of the water courses, *Tamarix* (*furas* Hindi, *Furwa* Punjabi, *Rhwa* Pushtu, *Ghuz* Persian) common as jungle, *Morus* (toot), and the larger variety of *Zizyphus* *Jujuba* (*ber* Hindi, *berra* Pushtu.)

Capparis *Aphylla*, (*karil* Hindi, *kirra* Pushtu) covered with showy flowers was abundant, and the other ordinary shrubs were as follows—the small variety of *Zizyphus* *Jujuba* (*Jharberi* Hi., *Karkan* Pushtu); a *Prosopis* (? Jand) which I had only met with for 3 days previously, generally as a shrub, but in one or two places as a middling sized tree; and an *Acacia* (*A. Arabica*?) neither of them in flower or fruit;—*Salvadora* *Persica* (*pilu* Hi., *plewan* Pushtu) occasional.

The commonest grasses were *Cynodon* *dactylon* (*dub* Hi., *barawa* Pushtu); *Eleusine* *flagellifera*, *dulu* Hi., *chubrei* Pushtu; *Andropogon* *Blad-hii*, *sewri* Hi., and a species of *Cenchrus*.

These, the ordinary plants about Tank, do not differ from those we had had most of the way from the Peshawur; as one of the exceptions to this, however, I may mention the *Salvadora*, which, although abundant from Scinde to Kohat, does not, so far as I am aware, grow in the Peshawur Valley.

The only novelties I got here were two *Asclepiadaceous* climbers, neither of them in flower.

The country round Tank is a nearly level plain the soil mostly of clay in horizontal strata, very little cut up by ravines, and in them only are occasional sand, and gravel beds found. The only deep ravine is one which runs along to the south side of the city. It is very marshy, and has an abundance of *Typha* *Angustifolia* (the English "Bulrush") *gond* Hi., *dib* Punjabi, *ruk* Pushtu, the leaves of which I observed to be used for thatch in the city.

In Tank itself, besides the ordinary Mulberry, &c., I noticed a few trees of *Pipul* (*Ficus* *Indica*), and also some of a very fine cultivated *Acacia*.

The Hemp plant, *bhang* Hi., was a common weed in the extensive gardens to the north of the city; and I saw one patch of a hirsute variety of Chicory, *Cichorium Intybus*, *kasni* Hi., cultivated for the *Punsario*.

On April 17th we marched from Tank, and after a gentle rise of some miles, entered the edge of the hill-country in the channel of the Zam, (it seems possible that this is a generic term for a river, as there is at least one other Zam, a few miles to the south of this, which is generally called the Tank Zam) up which lies the main road towards Kanu-gurm, the central city of the Mahsood Country.

The ravine was in most places at first, a wide and easy one, floored with shingle, and presenting occasional shrubs of *Tamarix* and beds of *Typha*, with *Equisetum debile*, &c. It has been formed by the stream in the course of ages cutting through the alternating strata of soft sandstone and conglomerate, which constitute the whole of the rock here, and which generally dip to the south-east at varying angles. These rocks, as Professor Oldham informs me, probably belong to the same section of the Tertiaries as the Siwalik, or Sub-Himalayan series, and parts of the salt range.

Here the common *Acacia Modesta*, *phulahi* Punjabi, *palosa* Pushtu, was in full flower and perfume; with *Capparis Aphylla* and *Salvadora* not uncommon;—and a small *Grewia* (*G. betulæfolia* ?) which is called by the Kohatis, *Shikari Mewa* (it is difficult to see why as he would be a hungry hunter indeed, who should be tempted to eat its miserable little fruit.)

The common grass was a tall dead *Arista*, and I found a good many plants of a new (?) *Andropogon*.

The Troops encamped at Khirgi Zerat, on a lofty plateau, composed of horizontally deposited beds of shingle, which here bordered the river ravine,—most of the rock in the neighbourhood was the conglomerate, generally nearly horizontal, but occasionally twisted and bent in a remarka-

ble way, especially at a gorge to the south-east of Camp through which the stream ran.

One march of April 18th carried us 10 miles further up the Zam.

Above Khirgi groves of *Vitex* (*Shamalu* H., *Murwandee* Pushtu) a common Indian shrub, were frequent along the edges of the ravine below the cliffs, and hanging from the latter, *Cocculus laevis* was frequent.

Dalbergia got more common, 1 or 2 small Date Palms were occasionally seen, and *Calotropis procera* (*Mudar* H., *Spulmei* Pushtu) which we had not seen the previous day, also got frequent. *Acacia Modesta* and *Capparis Aphylla* were common with a few *Salvadora*.

Peganum Harmala (*harmal* H., *spelane* Pushtu) a plant of the Rue Family, common from Delhi to Peshawur, was frequent; *Coscinia Calcitrapæforma*, *Centaurea Calcitrapa*, and *Carthamus*, occasional; *Malcomia Africana* and a *Plantago* with a sericeous broad spatulate leaf, frequent.

An *Arundo* (*A. Karka* ?) was common, with tall *Aristida* and a *Saccharum*.—The other grasses were *Alopecurus Pratensis*; *Polypogon Monspeliensis*—an aquatic grass—abundant; and *Cymbopogon Iwarancusa*, “lemon grass” frequent, but was almost destitute of its peculiar turpentine odour.

The geology of the day’s march continued much the same, the generally wide, shingly bed of the Zam, enclosed by low hills composed of conglomerate and soft sandstone in alternating strata, dipping mostly to the north-west at varying, generally low, angles. Here also, as on the previous day, part of the sides of the river valley (if so it may be called) was often filled up by horizontal beds of shingle frequently to the height of 50 or 60 feet forming plateaux from a few yards to many acres in extent.

At the place of our new Camp, Palosin (Qu: is this name derived from *Palosa*, the Pushtu name of the *Acacia Mo-*

desta ?) the country opened out considerably, *i. e.*, the higher hills retired to some distance, the plateaux on either side were of greater extent than usual, and close by the bed of the Zam was a low flat of alluvial deposit (under cultivation) large enough for the Force to encamp on.

On the south-west side of stream there was one place well supplied with moisture from Canals, where was a grove of *Dalbergia* and *Morus*, and a number of the smaller plants of spring, under the shade of trees, were still preserved from desiccation by their protection and the damp. Of these *Trigonella Incisa* was profuse, and there was still a few plants of *Arnebia Echioides*; a little Boragewort, one of those plants (it is a native of the Caucasus and Armenia) interesting as just extending from the westward into our Indian possessions; I have got it as far east as the Hurroo near Hussan Abdul. It has an agreeable odour and a pretty yellow corolla with 5 dark purple spots on it, which the Musalman about Peshawur and Kohat assert to be the marks of Mahomed's Fingers.—They call it "*Paighambari phul*," and hold it in high favour.

Another interesting plant not uncommon here was the *Withania Coagulans* of Affghanistan and Scinde, which extends some distance into the Punjaub, and is abundant in the Trans-Indus Territory. It is the *paneri* or *panere bad* of Affghanistan so called from being used (*e. g.*, in Candahar, as Dr. Bellew informs me,) to coagulate milk. It is not however applied to this purpose about Peshawur, where it is called *Shapyang*, and *Spin* (white) *Bujja*, in contradistinction to the *Adhatoda Vasica* which is called *tora* (black) *Bujja*; I may remark that Dr. Livingstone in his travels alludes to a plant of the same family (*Solanaceæ*, the egg apples, &c.) and it may be of the same genus, which, in some parts of Central Africa visited by him, is used for a similar purpose, and has a name of similar signification.

Fagrahlea Tenacissima, another western plant (of the

Nettle Family) extending to a short distance into India, was pretty common on the rocks bordering the ravine, while Salsolaceous Species were very much more rare here than on the saline Tank plain.

As about this place occurs a transition in the geology of the district, and the Flora also soon after this became altered, it was fortunate for me that the part of the Force to which I was attached, remained here for 12 days, so that I had full time to make many examinations into the nature of the vegetation, &c., about Palosin.

Although the hills around were quite as bare as those we had passed yet, there was more verdure near the banks of the stream on account of the numerous irrigation canals, some of which were works of great labour. A dry one I noticed was carried for at least 2 miles along the side of a hill, but as the hill surface was of loose soft sandstone, and the plateau to which the canal went quite barren, I presume that after all their Sisyphean labour, the Wuzeerees had found that all the water was lost ere it could reach its destination.

The ordinary shrubs were *Acacia Modesta*, *Zizyphus Jujuba* and *Capparis Aphylla*; another species of Caper, *Rhara* Pushtu, (probably *C. Spinosa*, whose young flower buds in Europe afford the culinary "Capers,") was occasional on the cliffs as high as this, and is pretty common in such situations on this frontier.

Abutilon Indicum, not uncommon but very small and stunted; a small leguminous shrub (*Taverniera*?) with pretty pink flowers, common—One or two climbing asclepiads occasionally occurred, and a curious almost leafless erect one, *bárrarra* Pushtu (*Periploca Aphylla*?) was frequent.

Of smaller plants there were *Solanum Nigrum*, a Pilose *Erodium* occasional; a pretty little *Polygala* with a bluish and white perianth; *Convolvulus pluricaules* common in some places. (It is esteemed by the Punjabis as a *thanda*

sag) *Coscinia Caloitrapa* abundant; *Boerhaavia procumbens* not uncommon, with another species of *Boerhaavia* only found in one place; a wild species of onion (*Allium Leplophyllum*?) called by the Punjabis *chiri* peyaz, profuse in places; *Rumex Visicana*, closely allied to the English "Sorrel," and with a similar pleasant acid flavour, a plant very widely distributed over the globe.

The grasses were as follows, *Andropogon Gryllus*, abundant, *Cymbopogon Iwarancusa*, and *Eragrostis Cynosuroides*, common; species of *Chloris* and *Elcusine Flagellifera* profuse on plateaux and ridges in the driest places; *Cynodon dactylon* only below where moist and swardy.

Among the more remarkable plants I got here were the following:—

A curious little plant of the *Poutulaca* Family with red fleshy, hairy leaves was not uncommon. The Punjabis call it *Haksha* and hold it to have medicinal powers.

A species of *Cometes* rare.

A shrubby spinous *Astragalus*, with yellow flowers, in general appearance not unlike the "Furze" of Britain, and forming in some places, a pretty large bush called *Zare* "yellow" by Pathans.

A small plant of the *Rubia* "Madder" family, allied to *Spermacoce*, with a scariose perianth and having perhaps the most disagreeable foetid odour of any plant I have ever met with. This I had got in some quantity on the skirts of Kaffer Kot in the first expedition, and here it was common.

A spinescent small shrubby *Convolvulus*; common at several places near camp.

A species of *Rhamnus* (a form of *R-Virgatus*?) *wurak* Pushtu, which I have found very common on almost all those hills on this Frontier that I have visited, with another, a spinescent *Rhamnus*, *Sherawane* Pushtu, not nearly so common.

I also found pretty frequent the *Tecoma Undulata*, a large

shrub of the Bignonia Family, with splendid large orange flower, by far the most gorgeous of any indigenous plant I have seen on the frontier. It is the *rebdoon* or *regdawan* of the Pathans, *whira* in Hindoostan.

A small labiate plant (Teucrium?) with an agreeable odour, abundant, and large odorous *Salvia* (?) occasional.

I also got here a curious little Asclepiad (*Caralluma* sp.) called *pawaue* Pushtu, *chunji* Punjabi, and *panj angusht* Persian.

The Perisian name is not a bad descriptive one as the plant looks not unlike a bunch of tetragonal *fingers* growing out of the scanty soil on rocky surfaces which it affects. Its stems have an intensely bitter taste, and are regarded by both Pathans and Punjabis as a capital tonic. The plant is not uncommon on the frontier.

On the 26th April, we moved camp fully a mile further up stream.

The change in the geology to which I have alluded was of this nature below Palosin; the whole of the rocks seen in *Situ* had been conglomerate or soft sandstone, probably contemporaneous with the strata of the outer Siwaliks. Immediately above our first Camp at Palosin, limestone began to crop out, frequently in the form of isolated knife-like ridges, to 60-70 feet high, the jagged edges of the nearly vertical strata rising aloft in the air and presenting a curious appearance. The most conspicuous of the sub-erect ridges were of a hard, white, non-fossiliferous limestone, very frequent; of a chalky appearance. Besides this there were a greyish hard limestone, a soft chalky-white do., both non-fossiliferous, and in several places beds of nummulitic limestone, literally *crammed* with shells, mostly small, and apparently not of many different species. This rock was best seen in a ridge between our first and second Camp, and on the upper slope of the bed, was a deposit of mounds of the nummulites (called, I am told *paisa*, by the inhabitants of places

where they are commonly found) caused by the disintegration of the binding portion of the rock.

Amongst the beds of limestone were occasional strata of various sandstone, coarse and fine, often externally of a semi-vitrified appearance, also numerous strata of decomposing parti-coloured shales, with much salt in their composition, and *these* exposed to the air, reduced to mere heaps of dark coloured dirt, closely simulating the ash heaps of a volcano, or of some Titanic smithy (such appearances are not uncommon in parts of the Trans-Indus Salt Range).

Another noticeable element of the geology here was the occurrence of numerous masses of limestone, varying from an inch to a foot or two in diameter, appearing entirely composed of corals, echinodermata, and similar forms.

These were nowhere found *in Situ*? but lying detached, among and upon mounds of debris of various rocks, and scattered over the vallies between the limestone ridges—once or twice I found the *impression* of the extremities of similar corals on the semi-vitrified surface of the sandstone I have alluded to, shewing that *in Situ* they must have been superposed on each other.

About half a mile above our new camp, there was quite a little grove of a Poplar (*Populus Euphratica*) in fruit, which has a curious diversity of leaf. The young leaves are long, lanciolate and entire, while those on the old branches are short, obovate, cuneate, with serrations on the apex, and in fact somewhat resemble a deformed native hair comb in shape. These are the extremes of a great variety of shapes. Here the tree was rather stunted and shrubby, but in the 1st Expedition there were some fine trees of it at one spot (near the foot of the Zakkar gorge). This Poplar has a wide distribution in Asia, having been first found near the Euphrates (whence its name) afterwards by Griffith on the Sutledge and Stocks in Scinde, and lastly by Dr. Thomson in the Nubra Valley on the Upper Indus in Thibet. Mr.

Deane, 3rd Punjaub Infantry, informs me, that he got it on an Island in the Indus near Dera Ghazee Khan. Its Native (Punjabi?) name is *balram*. I am surprized that it has not been introduced as a planted tree in the Dera Jat Cantonments, as this could probably be easily effected, and it would prove rather an ornamental addition to the small number of species of trees usually planted.

About our new camp *Aplotaxis Candicans* and *Oreoseris Lanuginosa* were frequent, also a tall *Cirsiod* plant having a large globular head of flowers with immense radiating spines, like a veritable "Caltrop."

In the bed of the stream *Typha Angustifolia* occurred in quantity, and *Equisetum Debile* was common.

Heteropogon Contortus was not rare. This is the curious "spear grass" with a tortile awn which by gradually *twisting* works itself through the clothes, or wriggles the specimen out from between the papers in which it is placed, *e. i.*, if it is put in at a certain stage of ripeness.

Other grasses were *Pennisetum Araneosum*, *Ps. Cinchroides* and *Digitaria Sanguinalis*, which in the Punjaub, are with *duh* reckoned the best for milk;—a tall *Saccharum*, *Andropogon Bladhii*; *Aristida*, *Sitacæ* and the tall *Aristida*; *Panicum Maximum*, a species of *Melica* with a fine feathery looking head, and *Imperata Koenigii* with its silky flowers.

On May 1st I was enabled to make a short excursion of 3 or 4 miles among the hills to the northward with the survey party, and found one or two novelties such as a species of *Edwardsia* in fruit. This when in bloom has beautiful tassels of yellow flowers, reminding one of the "broom" at home.

Also one or two specimens of a small shrub (*Xanthoxylon*?) and a fine odorous labiate allied to *Ballota*.

In addition to the usual shrubs *Reptonia Buxifolia* was plentiful. This plant was first described by Dr. Falconer, and is peculiar to the lower hills of our Trans-Indus Territo-

ry and part of Affghanistan. It is called *gurgura*, the fruit is eaten by Pathans, and I believe, its wood although small, is a useful one.

The *Tecoma* was common in fine flower. On one of the hills we visited, and in the escarpment of the same hill, there was an admirable view of the nummulitic between non-fossiliferous strata.

At Palosin we found the temperature much more pleasant than the height would have led us to suppose, indeed the Thermometer in Tents very seldom rose above 90° F., and there was almost always a breeze throughout the day generally easterly, although the prevailing wind at night was from the west.

May 2nd, we made a march of 4 miles, passing through a continuation of strata similar to those at the Upper Camp of Palosin.

A tall *Saccharum* was common near the edge of the channel of the stream.

A little capparidaceous plant (*Polanisia* ?) was got for the first time in some numbers; and one or two plants of *Eremostachys Laciniata*, a fine tall labiate with yellow flowers, indigenous in the Caucasus, Persia &c., and got sparingly about Peshawur.

There was here a greater number than usual of a shrubby *Acacia* (*A. Farnesiana*) *Nanja* Pushtu, which, though not nearly so common as the *A. Modesta*, is yet pretty frequent on the frontier, and had been occasional from Tank upwards to our present camp at Shingai.

May 3rd, march 4½ miles. The hills now fully or better covered with the usual shrubs than before, and numerous fine trees of the ordinary *Populus* (*P. alba*) *Salix* and *Morus* along the banks of the stream.

Plantago Lanciolata and 2 species of *Sonchus* all British plants, were common about water, with 2 *Cypercæ*, and the *Saccharum*, *Centauria Calcitrapa*, also common.

The rocks were similar to those of the previous day, varieties of limestone with occasional beds of the parti-coloured disintegrating shales, and just above our camp the ravine was narrowed into a gorge. (the *Tungai* or Pass of Anae) by a ridge of limestone, hardish, grey, non-fossiliferous, of 150 or 200 feet above the bed of the stream. The strike of these strata was south-west and north-east, they dipped at a moderate angle to north-west, and they *appeared* to me (I had not opportunity of examining them closely) to overlie very unconformably, indeed at nearly a right angle, the parti-coloured disintegrating shaly strata, where they met.

By our camp were some finer Olive trees than we had before seen. This is one of the common trees of all the lower hills I have visited on the frontier, (although except in favorable situations it is small and shrubby) and its well known hard wood is used for many purposes; it has been proposed by Mr. Cope as an Indian substitute for the Boxwood of Europe in wood-engraving, &c. This species is common in parts of the Himalayan range, and Wallich named it *Olea Cuspidata*, but it is now considered identical with the ordinary European oilolive (*O. Europæa*). The Punjabis call it *Kari*, the Affghans *Rhwan*.

In the ravines of a hill close by Anae where our camp was, I found abundance of *Sageretia* (an undescribed species ?) in fruit. It is very pleasant eating, and with several other species of the same genus, is the *Mumane* of the Affghans.

Reptornia also was common in fruit. The *Dodonæa Burmanniana*, frequently cultivated for hedges in our gardens and (erroneously) called "Bog-myrtle", and a *Celastrus* which with the former is common on all the lower hills of the frontier; these, with the Olive, constituted most of the shrubby vegetation of the hills here.

How, in the relation of cause and effect, the excessive aridity of the hills we had hitherto passed through, stands in

relation to the almost total absence of *Olea*, *Reptonia*, *Dodonæa*, *Celastrus*, *Sageretia*, I am at loss to guess, or has the nature of the rock ought to do with it? I have certainly seen all five common on hills that appeared to be quite as dry as those below Palosin, but then the former were lime or slate, the latter are as I have said entirely sandstone and conglomerate. In connection with this, I may remark that in the Bahadur Kheyl branch of the Trans-Indus Salt Range, I noticed a similar infrequency of these shrubs.

Again, the amount of saline ingredients in the rocks may have something to say to this, as from the number of *Sal-solaceæ*, and shrubs of *Tamarix* in the Zam below Palosin, there must be a considerable amount of salt in the rocks washed by its waters, whilst above Palosin, those salt loving plants have disappeared.

This may probably form an interesting subject of enquiry for future observers on this frontier.

May 4th, we marched 8 miles, but as the fight at the Barrarra pass occurred in the course of this march, hardly the same attention was paid to plants, that might have been given to them had our progress been unopposed.

Just after passing through the Anae gorge, the ravine of the Zam became considerably narrower than formerly, being enclosed by high cliffs of grayish limestone overlaying unconformably strata of the parti-coloured shales. The plateaux of horizontally deposited shingle also that occasionally skirted the ravine became here much higher than before, sometimes being as much as 150 feet above the bed of the stream.

The Flora now began to change considerably; there were one or two Peach trees occasionally and a new Fern was found, the only one of that family previously seen having been the *Adiantum Capillus Veneris* "maiden hair" which is sional in Britain &c.) common at damp shady places the frontier.

There also saw in the bed of the stream a cone of the *Pinus Longifolia* (the *cheer* of the Himalayas).

On the hills the "Dwarf Palm" *Chamærops (Mazare Pushtu)* was abundant. This is possibly the same as *C. Humilis*, the only Palm that is indigenous in Europe, and is common on the lower hills of Affghanistan and the frontier, above 1,500 feet; but it is not found I believe in quantity on the hills to the north of the Peshawur valley. Its leaves are of use for making mats, ropes, sandals, &c., and the reddish mossy hair found in the axillæ of the petioles is used by the Pathans for touch-paper.

At the pass where the enemy stood, the stream had cut its way through a ridge of the non-fossiliferous grey limestone, at a place where the hills on either side came much closer together than usual, and beyond this, the ravine in which our road lay was much more confined by the rugged heights on the right and left, and the character of the vegetation changed a good deal.

Fine trees of *Salix*, *Populus* and *Morus* continued abundant near the water.

Daphne Oleoides and a shrubby species of *Buxus* or *Sarcococca* were common, and both are called *Laghune*, by Pathans. The leaf and habit of both is alike, but the structure of flower and fruit quite different. The latter is, I think sometimes called *Shanda* "barren" *Laghune*, from its fruit not being eatable, whilst that of the former is somewhat juicy, and *may* be eaten.

Sageretia and *Olea* were common, with *Edwardsia* and a Bramble (*Rubus fruticosus*) hanging in masses on the cliffs.

Oaks were met with by some of those who crowned the hills to the south-west.

Just at the Barrana pass a few trees of *Punica Granatum* "Pomegranate" were in flower.

A *Mentha*-like *Uncaria*? but more pilose, yet unflowered,

was abundant, a fine Buttercup, *Ranunculus Cœvis* was common latterly, with a non-edible Strawberry (*Fragaria Indica*) the last not yet in flower.

Gardenia Tetraspuma, a shrub of the Madder Family, whose flowers have a delicate odour, and another small plant of the same family were both pretty frequent.

Close by our new camp at Bungewata was a fine jungle of *Vitex*, *Celtis*, &c., with abundance of *Eremostachys Lacinata* and a number of the small spring *Caryophyllaceæ*, *Crucifæræ*, &c.

The *Celtis* was probably *C. Nepalensis*, several species are tolerably common on these and the Affghanistan hills. They belong to the Elm Family, and having like many of their allies, tough wood, are approved of by the Pathans for Churnsticks.

The tree is called in Pushtu *Fagho*, and at Peshawur is occasionally to be seen planted at the Tombs of *Pero* as rather rare and graceful.

May 5th, we marched 15 miles to reach Kanugurm the Penetrale of the Wuzeerer Country, near which we encamped at 6,700 feet above the sea.

In the course of this march we soon passed quite out of the limestone region, the hills on either side being composed of various Schistose and slate rocks. In one part especially a bluish slate in thin beds was covered with the impressions of algæ or other low forms of aquatic vegetation, while a greyish slaty rock, in thick beds which occasionally alternated with the former was often remarkably bent as if it had while in a soft state been subjected to great lateral pressure.

During the latter part of the way, almost the whole of the semi-arboreous vegetation of the rounded hills above which we were gradually rising, consisted of 2 species *Quercus* (Oak) one of them *Q. luxiflora* probably, the other more common one, with a shorter, thicker, mealy-looking, coriaceous leaf.

The *Morus* and *Populus* continued common near the bed of the stream, but *Dalbergia* did not extend so far up.

From the great and sudden rise we made this day, I had rather an "embarras de richesses" as to plants, getting 30 or 40 species not previously met with in this trip. The more note-worthy plants were as follows:—

Of trees and shrubs Apricot was occasional, Peach common at one or two places; *Cotoneaster* (*C. Rotundifolia*?) common (a tough wooded shrub the *kheroa* or *kheraba* of the Pathans *rouns*, of the Himalaya) with a shrubby *Cratægus*? "Hawthorn" forming a pretty object with its masses of white blossoms and a *Spiræa* (*S. Lindleyana*?) abundant latterly, but not in flower:—

A *Buddleia* (*B. Crispa*?) rather a striking plant with its white leaves and white flowers was frequent.

A yellow flowered *Jasmine* (*J. revolutum*?) was rather rare;—of an *Abelia* (a shrub of the Honeysuckle Family,) with pretty little reddish flowers, and a delicious perfume, there were a few at one place.

Rhus Cotinus the "wig tree," so called from the brown hairs of its fruit panicles which give the shrub a curious look, was common.

Berberis Lycium was common. One or two plants of a *Clematis* (*C. Grata*?) were got.

And a shrubby *Indigofera* (*I. Niterantha*?) not in flower was occasional.

Of herbaceous plants the following occurred. Two spinous *Astragali* abundant latterly, both of them new to me, and probably Affghan forms, a *Galium* (*G. Tricorne*?) common in fields, *Scutellaria linearis* and another *S. Ajuga parviflora* and two or three other *Labiatae*; *Phagnolon* abundant on rocks half way, and a large species of *Coscinia* abundant latterly; a species of *Thymus* quite carpeted the ground and perfumed the air in places; a form of *Polygonum aviculare*, I had not met before profuse at our camp; a little

Valerianella abundant at camp about 6,000 feet ; a Geranium (G. Nepalense ?) common at one place, a Valeriana and a fine Saxifraga, not common, both at end of march.

Centaurea Calcitrapa accompanied us all the way, also of grasses the tall Aristida and Chloris sp :—

May 7th—I went with the Survey Party to the top of a hill called *Bar Pit* about 6 miles westward of our camp, and as it was 1,600 feet higher than the latter (indeed, the greatest elevation we reached during the Expedition) I got a number of plants that I had not as yet seen.

During the ascent, Berberis was common, Buddleia abundant, another species of Celtis (C. Australis ?) Edwardsia (a 2nd species) Spiræa Lindleyana, Rubus, and the Apricot. These were only got low, near the brook up the bed of which our road lay part of the way.

Higher up 2 Querci constituted the mass of the wood to the top of the hill ; a 2nd Clematis was occasional to the top ; a species of Lonicera (Honeysuckle) common ; a Jasmine (J. Officinale ?) common, the Abelia, occasional ; Indigofera and Viburnum Cotinifolium and Cratægus common, one or two specimens of a Syringa (Lilac) were got on the ascent, and a 2nd Cotoneaster.

Of herbs, there were met with *low*, Plantago Major, common near the Kanugurm brook, Oxalis Corniculata the “Wood-sorrel” or “Shamrock” (not uncommon also in the plain on the frontier) abundant, Trifolium repens ? (“white Clover”) common ; Adiantum Capillus Veneris frequent, Barbarea vulgaris ? and a Species of Sedum (S. adinotrichum ?) rare and higher up on the hill,—Taraxacum Officinale (Dandelion) common to the top ; Thymus and a Scutellaria abundant ; Morina Wallichiana, a fine thistle-like plant, common towards the top, and Scabiosa Succisa common, Senatula Pallida not uncommon, high ; one or two spinescent half shrubby Astrogali and several Umbelliferae frequent. Andosce incisa abundant, rather low,

a *Valeriana* rare; *Fragaria vesca*. (Strawberry) and a *Viola* both rather common high, but only in leaf; *Trigonella Emodi* a few, and a *Palygala* (*P. elegans*?) abundant at one part of hill.

The only parasitic plant found was *Viscum Album* "Mistletoe" which was abundant on oaks just opposite K. Village, and the only Orchid (I got during the whole expedition) was *Cephalanthera Ensifolia* which was common about half way up the hill. This Orchid is rare in Britain, but has now been found on the various northern mountain ranges from the extreme east to the farthest west of British India.

It was rather a disappointment to find that on the hill there were no *pinus*, although they were plainly visible at similar heights some few miles off, on the magnificent Pir Gal which here represents the centre of the Sulciman range.

Most of the strata of the hill appeared to be of a metamorphic slaty nature, generally dipping towards the north-west at a high angle.

This being higher than most of the other hills near (except Pir Gal and its congeners which tower some 3,000 feet above the former) commanded an extensive view, and it could be seen that although the various ridges of the hill-mass through which we had come, and which lay stretched below us to the eastward, were disposed very irregularly, yet there was a general tendency to a north and south direction; and the usual strike of strata as noticed on the way to and from Kanugurm from below corresponded with this.

On May 9th we marched 8 miles down stream by the same route as we had gone up, so that there was not much novelty for me; I however found *Rubia Cordifolia* not uncommon at one place about half-way. From the root of this plant is prepared the "Madder" (Munjith) of Nipal and probably of Affghaustan which form considerable articles of export to Europe.

There were also several bushes of a white Rose (not unlike *Rosa Webbiana* in habit of leaf but not nearly so prickly, and with a white flower) and a small *Veronica* (*V. biloba*) was abundant in fields.

The strata were, as before noted, mostly slaty, (blue and grey) occasionally nearly horizontal, and often remarkably bent and wavy, but generally with a dip of about 45° towards north-west.

The high masses of horizontally deposited shingle were still common along the skirts of the ravine of the stream, but its composition had changed greatly since Palosin, here it was composed mostly of slate and granitic pebbles, both of which were infrequent below, at, and some distance above the latter place.

Towards the end of the march to Dotoi, *Olea* became much more abundant, while *Quercus* had become much more scarce than about Kanugurm to which the *Olea* did not extend.

On May 10th we left our upward road, and marched to to the northward, following a feeder of the Zam.

Olea and *Quercus* were about equal in numbers, a few Pomegranate trees in a grove, and *Vitex* occasional where damp.

Mistletoe was common, an *Olea*, and the rose of the previous day occasional.

Erodium Cicutarium occurred, and *Chenopodium Botrys* was not uncommon (young) in fields. This plant (a small odorous "Goosefoot") I have frequently found on the frontier. It is of very wide distribution being found in southern Europe, Persia, Northern Africa and North America.

Of grasses *Cynodon dactylon* was abundant, and *Pennisetum Cinchroides* common.

Adiantum Capillus Veneris was abundant on damp cliffs.

The rocks were mostly the same as those passed through the previous day, and in some places irrigation canals had

been with much labour, tunnelled through the, slaty ridges.

Our new camp of Tandachena was on a plateau of the horizontally deposited shingle, where a small pink-flowered spinescent *Astragalus* and the Kanugurm *Consinia* were abundant. Shrubs were few and consisted of *Cotoneaster Rotundifolia*, *Olea*, *Berberis*, *Edwardsia* and *Daphne Oleoides*.

The commonest grass was the *Chloris*, which seems to delight in the driest possible situations.

I was here puzzled by a root brought me by an Afrcedie Sepoy. It is called in Pushtu *Kwerei*, is of a yellow colour, an inch thick, and woody, and has a strong but not disagreeable bitter taste. It is said to be abundant in Teera, and is much valued as a stomachic. I was not able to find the *plant*, but from the description am inclined to think, it may be a thorny *Smilax* and if so, it is related to the *Sarsaparilla* of the *Materia Medica*.

On May 11th I took the opportunity of accompanying up one of the spurs from the Pir Gal mass, a Regiment which was to aid in covering the operation of destroying the extensive collection of villages known by the name of Makin, situated round the edge of a small fertile basin watered by a brook, and enclosed by two of these spurs.

The ridge we ascended might be 300-400 feet higher than the Camp plateau, and had a scanty shrubby vegetation of *Quercus*, *Berberis*, *Edwardsia*, &c., with a few *Oleæ*. There were two or three trees of *Juglans Regia* (Walnut) near a hamlet, and I found a small, unflowered *Impatiens* common in shady places near a low brook; a *Datura* was abundant, young.

The hill was covered with shingle mostly granitic, and only could sight be had of the grey slate rock *in Situ*, in nearly vertical strata, dipping to the east—This was the nearest I got to the Pir Gal hill mass, the strata of all which,

so far as could be made out from a distance, appeared to have a similar dip and direction, but the colour was much darker.

May 12th—March of some 8 miles, still in a northerly direction, up the bed of the stream we had followed in the previous march.

Here, *Cotoneaster Rodifolia*, and *Berberis* was common; wild Peach trees abundant at one place; and a new shrubby species of *Berchemia* (first found by myself in Huzara) was frequent.

A nettle (*Urtica-urens* or *dioica*) called by the Pathans *Sazankei* "the Stinger" occurred at one or two places, and a curious member of the Goosefoot family, *Blitum-virgatum* (?) with a pretty red fruit, not unlike a Strawberry, but perfectly insipid, was frequent, part of the way.

Peganum Harmala was not uncommon; one plant of *Verbascum Thapsus* was got, and the little *Valerianella* was abundant at low places.

A creeping *Convolvulus* with very white sericeous leaves abounded in fields latterly, and a very pilose species of *Ceratocephalus* (a remarkable genus of the Crowfoot family) was profuse in one little field.

Just before reaching our new Camp at Cuzmak, we passed an extensive mass of the thin blue slate marked with impressions of *Algæ* (noted before, as occurring on the way to Kanugurm) overlaying the strata of a ridge of metamorphic looking clay-rock, both dipping at a high angle to the west.

Our road lay up the ravine which the brook had cut through a wide, sloping mass of the shingle which filled up part of the space between the higher hills to the right and left, and there was a considerable ascent till we reached our Camp, which was the highest (7,300 feet above the sea) we had during the Expedition—Near it there were one or two of the finest trees of *Populus Alba* I have ever seen.

On May 13th, we halted, and I took a short round by a hill to eastward of camp, and found, besides abundance of the ordinary spring plants of the frontier—a 2nd species of *Delphinium*, profuse, a fine thistle (*Carduus Nutans*, a British species) also abundant and greedily eaten by the camels, who had hardly left me a specimen worth taking; *Diplopappus Molliusculus* (?) rare, *Thlaspi Arvense*, profuse in fields, and in one place there was abundance of a species of *Hyoscyamus* (probably *Hyoscyamus niger*, the common Henbane of Britain) called in Pushtu *Dumtura* and *Bangilewune*, and said to be abundant in Teera.

May 14th.—March of some 5 miles to north-east. For the first mile and a half we continued to ascend in the bed of the stream as before, but then made a very rapid descent the rest of the way in a rough, precipitous gorge, generally dipping to the east, at a high angle, and occasionally much bent.

Down this ravine ran a small brook, the commencement of Khyssore, which debouches into the plain a few miles to the south of Bunnoo, and the course of which we afterwards followed in a northerly direction till we issued from the hills 5 days subsequently.

The common shrubs were, 1-2 species of *Quercus*, *Cotoneaster Rotundifolia*, *Berberis*; *Daphne Oleoides*, *Viburnum Cotinifolium*, occasional; *Edwardsia*, *Berchemia*, two shrubby spinous *Astragali*, *Cratægus*, *Buddleia* a few, and *Olea* abundant.

Sageretia and *Reptonia*, which had not been seen for many days here began again, and seedling plants of *Celtis* were common in the bed of the stream.

The only novelty was a spinous Caryophyllaceous herb, of which a few prickly clumps were seen near the level space on which our camp was to be pitched. To get to it, we rose from the stream to the right (east) over the edges of strata of a ferruginous metamorphic rock dipping at a very high angle to the north-east.

The district about Kanugurm has long been noted for its *iron*, of which large quantities are, in the cold season, brought into the weekly market at Bunnoo by the Wuzerees.

From about 5th May, furnaces with large collections of ore and slag had frequently been seen by our Troops in villages, but no where before had I observed any place so likely to be near the ore *in Situ*; I therefore made attempts to get a sight of the mine but failed. The process of mining I understand to consist simply of following the out-cropping ferruginous strata by scraping off the superincumbent non-metalliferous rock, both generally sloping at a high angle.

It would be a matter of interest, and not probably of great difficulty, to get the Wuzerees to bring down sufficient quantities of the ore, and the rocks among which it is found, to enable competent judges in so far to decide on the capabilities of this district as an iron producing one.

Just at our camp the pilose *Ceratocephalus* was abundant in fields, with the Kanugurm form of *Polygonum Aviculare*, and on the dry rocky ridges *Pennisetum Araneosum* was common.

On May 15th we marched 11 miles down the Khyssore. There were groves of fine *Olivia* trees, just below the village of Razam, at which we had been encamped.

The strata shewn in section in the ravine were mostly of various slates, generally dipping at a high angle towards the west, and often with thick beds of shingle overlying them horizontally.

Quercus was abundant at first, but rare latterly, and *Daphne Oleoides* was common in flower.

Rhamnus Virgatus, *Acacia Modesta*, the *Celastrus*, a species of *Asparagus*, *Ephedra*, *Chamærops* and *Periploca*; all these began here, after being absent at the higher altitudes to which we had reached.

Also *Andrachne Telephioides*, *Aplotaxis Candicans*, *Helio-*

tropium Ramosissimum, Boerhaavia Procumbens, Spargularia Rubra, and Solanum Jacquinii reappeared this march.

A foetid, white tomentose labiate (*Salvia-Lanata*?) was common most of the way; *Verbascum*, *Thapsus*, *Peganum Harmala*, and the *Cocsinia* of Kanugurm common; young plants of *Celtis* were occasional in the bed of the stream.

Of grasses, the tall *Aristida* was abundant, and I got one or two tufts of a curious *Rottboellia*, the head of which looks exactly like a number of short cylindrical joints placed end-to-end, *Aristida sitacca* *Cymbopogon-Iwarancusa*, *Eragrostis Cynosuroides* and the tall *Saccharum*, were also seen ere the end of this march.

Linaria Cabulica was occasional on cliffs (*L. Ramosissima* however, had been the form most frequent in the district.)

I found in fruit a few trees of the *shnee* (Pushtu) a new species of *Pistacia* seen sparingly during both Expeditions, a species of *Statice* was got, unflowered, and one or two plants of a small *Dianthus* "Pink."

The spinous Caryophyllaceous plant of the 14th was abundant at our new Camp of Siroba, where *Reptonia*, with a few *Olea*; and *Acacia Modesta* was the prevailing shrub.

May 16th, march of 11 miles down the Khyssore—*Morus*, *Populus* and *Salix* were common along the banks of the stream, although the previous day, none of either of the two former were seen.

Arundo karka (?) was common, and *Polypegon Monspe-liensis* profuse.

A few small *Tamarix* occurred in the bed of the stream, and *Tecoma* was occasional.

Dodonæa was abundant in high dry places, forming with *Celastrus* and *Acacia Modesta*, the chief shrubby vegetation, *Cocculus Leæba* on cliffs, and *Vitex* below near water common.

Achyranthes Aspera occurred on rocks, *Aplotaxis Candicans*, also a few, *Lactuca Auriculata*, one or two plants of

Hetropogon Contortus were found, and *Avena sativa* was abundant in barley-fields on this and the preceding day.

Centaurea Calcitrapa was abundant and *Cirsium Arvense* common, *Calotropis Procera* re-appeared, a species of *Lycopus* was occasional at water, and *Eremostachys* common in several places.

Plantago Lancilata was profuse near water, with *Verbena Officinalis* and *Samolus Valerandi*; and *Typha Angustifolia* was common in marshy spots.

Cannabis Sativa was occasionally seen, also *Zizyphora Tenuior*, one or two Pomegranate trees occurred, and *Celsis* was not uncommon as a small tree.

Eriophorum Comosum a curious cottony headed kind of sedge was not uncommon on cliffs, and in such situations also, *Capparis Spinosa* re-appeared. *Fagonia* and *Malcomia Africana* were not uncommon.

Plants of a *Colocynth* (*Cucumis Colocynthis*?) frequently found on the frontier, and often met in the lower part of the Zam, began to appear again, as did *Acarna Javanica*.

The rocks seen *in Situ* were mostly slaty, and their dip was towards the west, almost at right angles to what it had been the previous day. We halted at Dawawarka.

May 18th.—March of 10 miles down the stream, and in the course of it leaving the slate behind us, pass through a tract geologically similar to that at Palosin, with ridges of limestone, heaps of parti-coloured, decomposed shales, and blocks of the Echinodermata, and Nummulitic limestones scattered about, &c.

We then entered upon the tract of sandstone and conglomerate, thus almost exactly taking in reverse the series of rocks we had passed through in ascending the Zam. Both the sandstone and limestone tract, however, appeared to be of much smaller superficial extent here than on the Zam.

We had now at Spanwarn almost got into the plains, the crops were ripe: the *Vitex*, in flower, and *Capparis aphylla*,

Zizyphus Jujuba, *Acarna Javanica*, and the other ordinary Frontier plants abundant.

May 19th. The first mile and a half of the march carried us quite out from between the low sandstone hills, amongst which our Camp had lain, and into the plain of Bunnoo, which place we reached on the 20th May.

In taking a short general view of the vegetation of the country passed through, we find that it may from the nature of its Flora be conveniently divided into two zones or regions an outer (lower) one, from the level of the plains of Tank and Bunnoo, about 1,000 feet above the sea up to about 3,500 feet, which would comprehend the Zam from the plains up to Anae and the Khyssore up to Dawawwarka; and an upper zone nearer the centre of the mountain range comprehending all the tract of country above these two places, that we visited, *i. e.*, from about 3,500 to 8,300 feet, and including the upper part of the Zam and its tributaries, the hills near Kanugurm and Makim, and the Kuzmuk Pass.

I shall now proceed as concisely as possible to notice, even at the risk of repetition each of these Zams, beginning with the former and lower one.*

Of trees there are almost none met with in this region if we except the four or five species (a *Salix*, a *Populus*, a *Dalbergia*, 2 *Mori* and a *Ficus*) which are frequent along the banks of the Zam and canal, but which, if not introduced, have at least been fostered and spread by man's aid.

The indigenous *shrubs* of this zone, are in some numbers and mostly similar to those ordinarily found in the lower dry hills along this frontier; without attempting any arrangement of these, as to comparative frequency, the chief natural orders and genera represented are briefly as follows:—

Of *Menispermaceæ*, *Cocculus* (a half shrubby climber) common.

Capparidaceæ, 2 species of *Capparis*, both common.

Malvaceæ, *Abutilon* very small and stunted.

Tiliaceæ, 2 small species of *Grewia*, common.

Sapindaceæ, *Dodonæa* abundant.

Celastrineæ, a small *Celastrus* abundant.

Rhamnaceæ, 2 species of *Zizyphus* and one of *Rhamnus*, common, 2 of *Sageretia* less common.

Terebinthaceæ, a species of *Pistacea*, rare and only towards the upper limits of the zone.

Leguminosæ, one *Acacia* abundant, another rare, 2 spinescent *Astragali* not uncommon, an *Edwardsia* occasional in the upper parts of the zone, and a small bushy *Taverniera* (?) abundant.

Tamariscineæ, a *Tamarix*, abundant in the lower and more saline parts only.

Myrsinaceæ, *Reptonia* common, not in the saline district.

Oleaceæ, *Olea communis* :—

Bignoniaceæ, *Tecoma* common, but not abundant.

Convolvulaceæ, a spinescent bushy convolvulus rare.

Ehretiaceæ, *Ehretia*, pretty common.

Acanthaceæ, *Adhatoda* common, only near the outer edge of the zone.

Verbenaceæ, *Vitex* common, and a *Lantana* (?)

Salvadoraceæ, *Salvadora*, common.

Ulmaceæ, a *Celtis* common near upper limit of zone.

Gnetaceæ, an *Ephedra*, abundant in driest part.

Palmæ, *Chamærops*, common.

The herbaceous vegetation of this zone shows, as do the ordinary spring herbs of the Punjab and North-west Provinces, a strong resemblance to that of Europe, indeed the genera and even the species are, in many cases, identical with those of Britain.

The statistics of the herbaceous plants of the zone may be generalized as follows :—

Of Ranunculaceæ, 2 or 3 species of *Ranunculus* and *Adonis*—all British species, common.

Papaveraceæ 3 species, one of them British—occasional.

Fumariaceæ, Fumaria, British—abundant where damp.

Cruciferæ, 8 or 10 species, several of them British (we were much too late for most of the plants of this order, which generally precede those of most others in this part of India.)

Violaceæ, one small Viola, common.

Polygalaceæ, 2 species of Polygala, both rather common.

Caryophyllaceæ, 3 or 4 species. (This order also is a *very* early one.)

Linaceæ, a Linum, not uncommon.

Euphorbiaceæ, a Euphorbium, and an Andrachne.

Malvaceæ, a Malva, British—common.

Geraniaceæ, a Geranium, common.

Oxalidaceæ, an Oxalis (the Cosmopolitan O. Corniculata,)

Zygophylleæ, Fagonia, abundant, mostly near the outer margin.

Rutaceæ, Peganum, occasional; Tribulus.

Leguminosæ, 5 or 6 species, half of them British.

Rosaceæ, a Potentilla, not uncommon.

Cucurbitaceæ, a Cucumis not uncommon.

Umbelliferæ 4 or 5 species.

Rubiaceæ, 2 species one them (Galium) British.

Dipsaceæ, a Scabiosa, common.

Compositæ, 19 or 20 species, several of them British.

Primulaceæ, 2 species, both British.

Apocynaceæ, Rhazya (half shrubby) occasional near outer margin.

Asclepiadaceæ, 5 or 6 species, 2 of them erect, the rest climbers.

Convolvulaceæ, 2 or 3 species of Convolvulus.

Boraginaceæ, 5 or 6 species, 1 or 2 of them British.

Solanaceæ, 4 species.

Scrophulariaceæ, about 5 species, 2 of them British.

Acanthaceæ, a Dicliptera, not common, near outer edge of zone.

Verbenaceæ, Verbena, British.

Labiatae, 7 or 8 species, none of them, I think, British.

Plantaginaceæ, 2 or 3 species of Plantago.

Salsolaceæ, 5 or 6 species, but only in saline part near outer margin.

Amarantaceæ, 3 species, 2 of them Amaranti.

Nyctaginaceæ, 2 species of Boerhaavia.

Polygonaceæ, 3 or 4 species of Polygonum and Rumex.

Thymelaceæ, one species of Thymelæa, occasional near outer margin.

Urticaceæ, Forskåhle, common.

Of Endogens only 3 natural orders are represented thus :—

Liliaceæ, an Allium and an Asparagus.

Cyperaceæ 4 or 5 species.

Of grasses, about 40 species, (at least 10 of them British) including the following genera; 4 species of Andropogon, 3 or 4 of Panicum, 2 of Pennisetum, 2 of Aristida, and at least one species each of Heteropogon, Eragrostis, Digitaria, Dactyloctenium, Bromus, Eleusine, Cynodon, Koeleria, Melica, Imperata, Avena, Cymbopogon, Agrostis, Phalaris, Alopecurus, Chloris, Lolium, Sporobolus, Poa, Saccharum, and Arundo, only one Fern, the Adiantum, abundant.

In regard to the second (upper or inner) zone, it deserves remark that although abundance of *large forest-trees* would have been found even in the most western Himalaya, at heights similar to those we reached (8,000 feet), yet the largest plants we met here were species of Quercus, which in strictness could only be called sub-arboreous being very seldom indeed more than "three times the height of a man."

Doubtless there were numerous Pines and (probably) other large trees on Pir Gal &c., but we can hardly take them into our estimate, as we did not reach that hill.

So that, as before, I will classify the vegetation of the upper zone into 1st, Arbusculous and shrubby and 2nd Herbaceous.

The more note-worthy families and genera of shrubs were as follows :—

Ranunculaceæ 2 (or 3) species of clematis ;

Berberidæ, a Berberis.

Euphorbiaceæ, a Buxus (or Sarcococca?) common near lower margin only.

Rhamnæ, a Berchemia, a Rhamnus (just above lower margin) and a Sageretia and Zizyphus not to higher parts.

Terebinthaceæ, one species of Rhus.

Leguminosæ, an Indigofera, an Edwardsia, and 2 spinescent Astragali.

Rosaceæ, 2 or 3 Cotoneasters, and one species each of Rubus, Prunus, Cratægus, Amygdalus, Spiræa and Rosa.

Myrtaceæ, Punica Granatum.

Caprifoliaceæ, 2 species of Lonicera, and one each of Abelia, and Viburnum.

Rubiaceæ, a Gardenia, near lower margin only.

Oleaceæ, a Syringa, rare, and an Olea, to some distance above lower margin.

Jasminæ, 2 species of Jasminum.

Loganiaceæ. Buddleia common.

Thymelaceæ, a Daphne, common.

Amentaceæ 2 (or 3) species of Quercus.

Ulmaceæ, 2 species of Celtis.

Gnetaceæ, Ephedra just above lower margin.

One parasite, Viscum, was common on Oak and Olive at various places in the zone.

The more prominent herbs of this zone may be briefly analysed thus—

Ranunculaceæ, 3 species of Ranunculus, and on each of Delphinium, Adonis, Aquilegia(?) and ceratocephalus.

Berberidæ, a species of Epimedium (?)

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Papaveraceæ, a Papaver just above lower margin.

Fumariaceæ, a Hypecoum and a Fumaria.

Cruciferae, 11 species including one each of Barbarca, Thlaspi, Neslia, Lepidium, Arabis, and Sisymbrium.

Violaceæ, a Viola only in higher parts of zone.

Polygaleæ, Polygala.

Caryophyllaceæ, one species each of Silene, Stellaria, Dianthus, and a spinous species.

Euphorbiaceæ, 2 species of Euphorbia.

Malvaceæ, 2 species.

Geraniaceæ, a Geranium and an Erodium.

Balsamineæ, one Impatiens.

Oxalideæ, Oxalis (coniculata.)

Leguminosæ, 3 or 4 herbaceous Astragali, 2 species of Trigonella, 2 of Vicia, and one each of Medicago, Lotus, Lathyrus, and Trifolium, and 5 of other genera.

Rosaceæ, 2 species of Fragaria and 2 of Potentilla.

Crassulaceæ, a Sedum.

Saxifragaceæ, a Saxifraga.

Umbelliferæ, 4 species.

Rubiaceæ, 4 species, including 2 of Galium, and one of Rubia.

Dipsaceæ, 1 species each of Scabiosa, Morina, Valeriana, and Valerianella.

Compositæ, 23 species including 2 of Gnaphalium, and one each of Cousinia, Phagnolon, Serratula, Diplopappus, Carduus, Francoeuria, Filago, Aplotaxis, Sonchus, Taraxacum, Cirsium, Artemisia, Echinops, (?) Bidens (?) with 7 of other genera.

Primulaceæ, an Androsace, and Samolus.

Asclepiadaceæ, one climbing, and one erect species.

Convolvulaceæ, 2 species of Convolvulus.

Boraginaceæ, six species, including one each of Lithospermum, Rochelia, Nonca, and 3 of other genera.

Solanaceæ, a Hyoscyamus, a Datura, and a Solanum.

Scrophulariaceæ, 8 species, including 3 of *Veronica*, 2 of *Scrophularia*, one of *Linaria*, and 2 others.

Verbenaceæ, *Verbena*.

Labiatae, 25 species, including 2 or 3 of *Mentha*, 2 of *Scutallaria*, 2 of *Ajuga*, and one each of *Thymus*, *Nepe-
ta*, *Lycopus*, *Lallemantia*, *Plectranthus*, *Eremostachys*, *Sal-
via* (?) and eleven others.

Plumbaginaceæ, a *Statice*.

Plantaginaceæ, 2 species of *Plantago*.

Salsolaceæ, 2 species of *Chenopodium* (near lower mar-
gin of zone) and one of *Blitum*.

Polygonaceæ, one aquatic and one terrestrial *Polygonum*,
and one *Rumex*.

Urticaceæ, one species of *Urtica*.

Cannabinaceæ, *Cannabis*.

Orchidaceæ, common one place near upper margin only.

Liliaceæ, 2 species.

Alismaceæ, *Alisma*.

Equisetaceæ, an *Equisetum*.

Juncaceæ, one *Juncus*.

Cyperaceæ, 6 species, including 2 *Carices*, a *Cyperus*, a
Malacochaete, a *Fimbristylis*, and one other species.

Graminaceæ, 15 species, including one each of *Rottbœl-
lia*, *Andropogon*, *Bromus*, *Dactylis*, *Chloris*, *Saccharum*,
Digitaria (?) *Sporobolus* (?) and 7 of other genera.

Filices, an *Adiantum* and one other species.

In the reviewing the vegetation of this upper district it
is worthy of note that most of the genera, and even species
shrubs are identical with Himalayan plants, while the num-
ber of western and northern forms (*e. g.* *Ephedra* and pro-
bably some of the species of *Celtis*, *Quercus* and *Rhus*) is
very small, whereas, of the *herbaceous* plants a very large
proportion are western and European forms. But any
minute analysis in this respect would be premature, until
there has been an opportunity of determining the species

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of many of the plants more definitely than I have been able to do.

Such is a summary of about 400 species of plants got between Tank and Bunnoo, about 70 of these being shrubby or subarborescent, and the rest herbaceous.

The singular paucity of Endogenous plants (grasses excepted) and tropical forms, in *both* zones, is very remarkable.

It seems hardly necessary to say, that the value of the *timbers* of these hills is to *us* in an economical point of view, very small; if we except the possible supply of firewood to a certain extent by the shrubby vegetation of the outer zone, which as we have seen, is so similar to that all along the frontier, and but few of the uncultivated shrubs fitted by quality and size for being of use except in the construction of agricultural implements, and the roofs of very small buildings, &c. It does not appear likely that the benefit to be derived from the use of the timber of the small oaks &c., of the inner region for building purposes, would compensate for the great distance from the plains; while the labour of conveying the pine timbers of Pir Gal, &c., to even Makin and Kanugurm must be very great, now much more than transport to the distant plains.

In bringing this sketch to a close, I have to apologize for its many imperfections.

Those in the botanical part are in some measure, the result of this having been the first extensive Affghan hill district that I have had an opportunity of visiting; while for the few barren remarks, I have ventured to make on the geology of the country, I must plead as apology my most imperfect practical acquaintance with that science. To this excuse may be objected the proverb "*ne sutor*" &c. but it seems better to insert even *these* observations made in a country previously unexplored, than to leave the subject untouched.

With its defects fully in my mind, I have thought it preferable at once to send in this paper as it is, than to delay its submission to Government for the intolerable time necessary to render it more worthy of perusal by means of a reference to distant authorities and collections, and as I have generally only trusted myself when my data are pretty sure, the errors will, I think, be found to be more of omission than of commission.

Signed,) J. L. STEWART, M. D.,

PESHAWUR :

Asst. Surgn.

The 5th July, 1860. In medl. charge 14th Punjaub Infantry.

Memoranda on the sowings of Hill poppy seed in Behar and the N. W. Provinces.

[At the monthly general Meeting of the 11th June the following memorandum was read from Mr. W. Peppe, on the result of his sowings of the Hill Poppy seed received last year from the Society, being a portion of the supply contributed in July 1861, by Lieutenant J. F. Pogson. (Journal, Vol. XII., page 46.)]

On receiving the seed I had it divided into several parcels and distributed amongst experienced cultivators; I also had it sown in my garden at different times, but in every case in conjunction with Patna seed.

The first plot was sown about the 5th November; the seed germinated, but the young plants died off. The Patna seed on the other hand, did not germinate so freely, but the plant stood and grew into vigorous plants: the same result followed with the ryots, and not a plant of the first sowings survived.

The next sowings were about the 25th November; as the weather had by that got quite temperate, the plants arrived at maturity and gave a very good yield of opium, but the capsules were very small, and the ryots did not give a satisfactory report of them.

I thought that the small size of the capsules resulted from the non-irrigation of the plots, but I had afterwards an opportunity of examining a plot which had been regularly watered, and on this also the capsules were small both in comparison with the Patna seed and also with common seed of the neighbourhood.

The great desideratum with us is poppy which will bear early sowings, say on the 15th of October. It makes a difference of fully two hundred per cent, in the yield, if the plants arrive at maturity by the end of January.

This year I have induced many of the Assamees to sow on or about the 15th October, by offering a reward of ten rupees for the first seer of opium; and they are unanimous as to the great advantage derived from this practice, the only objection is that the young plants are so liable to die off.

The yield of the successful competitors was twenty seers per beegah, and even then the crop was not full, that is, there were empty spaces all through the field, but then each plant had some twelve or fourteen capsules, and each capsule was "patched" some seven or eight times.

I am in hopes that should this practice be adhered to, that an early variety of the poppy may be obtained, and in the meanwhile the result of last season will, I think, ensure the Assamees giving it a fair trial in this district.

It would be advisable that another batch of seed be sent down from the hills for a fresh trial, but it would be very desirable that some of the Turkey seed be imported from Smyrna, both on account of the high quality of the opium and also as a new variety. I have no doubt that the Agricultural Society would be able to effect this.

Poppy seed grown for several years in the same locality gets deteriorated, and becomes very liable to a disease called by the natives "Moorkha," and is caused by a fungous growth in the stem and leaves of the plant.

[Read also the following extract of a letter from Mr. C. Armstrong, of Ghazepore, to Mr. Grote's address on the same subject.]

Here is a little statement showing the average yield per beegah from land sown with "Patna," "Country," and "Hill seed." This land is much of the same kind, not far apart, and cultivated by eight Assamees.

No. Assamee	Kind of Seed	Produce per Beegah	
		Seers C.	
1	Patna seed	..	11 3
2	Country seed	..	4 0 $\frac{1}{4}$
3	Ditto	..	5 11 $\frac{3}{4}$
4	Patna seed	..	4 7 $\frac{3}{4}$
5	Country seed	..	10 5 $\frac{1}{2}$
6	Hill seed	..	1 14
7	Country seed	..	10 15
8	Ditto	..	9 0

"This shows the Hill Poppy this year to be a failure. The plant germinated pretty well *where it did grow*, but when some four or five inches high the leaves began to turn yellow, this change does not generally occur before the plant is from one to two feet high, at which time the leaves gradually commence withering at the lower part of the plants extending up until the whole plant becomes dry as the juice is collected. The Hill Poppy grown here had not sufficient strength to remain upright, but trailed most part of its stem on the ground. The flowers are not only red and white, but various colours. I don't know how to account for the plant being so weak, the seed perhaps may not have been fresh; it could not be owing to indifferent land, it was prepared as other poppy lands are. I think as the experiment has been made here, it is sufficient to condemn the Hill Poppy being introduced. Were it reported on favourably I doubt the Assamees changing their own poppy seed which always yields well in a good season.

[The following letter was read at the monthly general meeting of the Society on 10th August 1862,—from Lieut. F. Pogeon, Simla, 1st. August 1862.]

“I see by the Society’s Proceedings (11th June 1862) that the Hill Poppy seed has proved to be a failure. I cannot make out why the seed was sown in November, instead of September. I sent a lot of seed to Mr. Hamilton, Government Opium Agent, Ghazeepore, for September’s sowings, but I have never been informed when it was sown. I observe Mr. W. Peppe states:—‘The great desideratum with us is poppy which will bear early sowings, say on the 15th October.’ In reference to the above, I shall be happy to send you down a seer or more of Hill Poppy seed of my raising: the seed was gathered early in June, and is therefore as fresh as it can be; it is almost pure white poppy seed, though a few *red* poppy seeds may have been mixed with it. If you will cause this seed to be tried, I will send you down some on hearing from you. I would wish this seed to be sown as soon as the Patna rains are over, whether that event takes place in September or October being immaterial. The said seed should be tried on tobacco lands, or such land as contains a good percentage of iron in the soil. In selecting land for the poppy care should be taken to avoid calcareous soils; the less lime there is in the soil, the better for the poppy. I suspect Mr C. Armstrong, of Ghazeepore, selected a calcareous clay for his experimental Hill Poppy field, and if so, the failure of his experiment is accounted for. In the hills, the opium is not grown on calcareous soils, but in soils which contain much iron, sand, and some clay—poor soils in fact—and if such soil is to be met with in the plains it would suit hill opium well; but iron seems to be an essential ingredient in opium soils. Perhaps the hills near Rajmahal would afford such soil—any red soil, be it in the hills or plains, contains iron, and will do for poppy; but the higher above the sea, the better

is the opium. It will interest you to know that my second poppy crop is coming on famously. The seed was sown in June, just as the rains set in, and as soon as we have a break in the rain, I will begin to thin out my plants, and trust in November to send you down some opium made in that month. I made a small quantity of opium in May, which a wealthy opium eater tells me is very superior. I also made an extract from poppy-heads ripe for tapping. This is also pronounced to be very good and strong. In November I will (D. V.) send down samples of opium and extract. My idea is that the latter article contains far more morphia than our best opium, and if so, it would suit the London morphia manufactures admirably. I think opium making on the present plan a very slow and primitive process, and if my new plan extracts all the morphia and narcotine present in the pod, it is much to be preferred. It is curious that the extract, as made by me, has not the slightest smell of opium, though whilst being made its steam as given off is quite unbearable from the peculiar smell of opium. The said odour gives me a headache.

“If you will get it analysed, I will, on hearing from you, send down some of this extract. I would wish to know its richness in morphia and narcotine. Pray answer me on this point.”

[The Meeting resolved that Lieut. Pogson be asked to forward a sample to the Society for analysis.]

Monthly Proceedings of the Society.

(Wednesday, the 15th January, 1862.)

A. Grote, Esq., President, in the chair.

The Proceedings of the last Monthly Meeting having been read and confirmed, the members proceeded, in accordance with the Bye-laws, to the election of Officers and Council for the current year; and the President having appointed Mr. J. E. MacLellan and Dr. W. H. Hayes to be scrutineers, they reported the result to be as follows:—

President.—Mr. A. Grote.

Vice-Presidents.—Mr. S. P. Griffiths, Baboo Shibchunder Deb, Mr. Stewart Douglas, and Baboo Gobindchunder Sen.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. S. H. Robinson, Mr. C. B. Wood, Mr. T. E. Carter, Dr. J. B. Barry, Mr. C. A. Cantor, Rajah Pertaub Chunder Sing, Mr. W. G. Rose, Baboo Peary Chand Mittra, Dr. T. Anderson, Mr. W. Haworth, Mr. C. B. Stewart, and Mr. W. S. FitzWilliam.

The revision of the Standing Committees was next entered on, and the names of the following members were added where vacancies had occurred, viz.:—*Cotton.*—Mr. FitzWilliam; *Oil and Oil Seeds.*—Mr. H. Demornay; *Nursery Garden.*—Mr. C. B. Stewart; *Floricultural.*—Messrs. J. S. Elliot and C. B. Stewart.

The Secretary read the Annual Report. [It is not deemed necessary to introduce the Report in this place.]

Proposed by Mr. S. P. Griffiths, seconded by Mr. Stewart Douglas, and resolved, that the Report of the Council be received and adopted.

The ordinary business was then proceeded with, and the following gentlemen, proposed at the last Meeting, were duly elected members:—

Messrs. F. E. Elliot, C. S.; F. A. Tilton; John Parratt; H. G. Temple, and Lieutenant F. H. Lewin.

The names of the following gentlemen were submitted as candidates for election:—

P. J. Delauney, Esq., Indigo Planter, Tipperah,—proposed by Captain E. H. Wintle, seconded by the Secretary.

R. H. G. Matthews, Esq., Rampore Factory, near Benares,—proposed by Mr. Thomas Wilson, seconded by Dr. A. H. Cheke.

Henry Mead, Esq., Calcutta,—proposed by the Secretary, seconded by Mr. Stewart Douglas.

W. G. Howard, Esq., Manager Sylhet and Cachar Tea Company,—proposed by Mr. W. F. Fergusson, seconded by Mr. C. B. Stewart.

Edwin Hudson, Esq., Singheer Factory, Tirhoot,—proposed by Mr. R. Blechynden, seconded by the Secretary.

J. P. Sagrandi, Esq., Merchant, Calcutta,—proposed by Mr. W. G. Rose, seconded by Mr. Douglas.

Nichol Macnicol, Esq., Howrah,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Henry A. Aubert, Esq., Indigo Planter, Benares,—proposed by Mr. Douglas, seconded by Mr. Robinson.

The Council announced that they had fixed on Wednesday, the 29th of January, for the first show of the season, to be held in the Auckland Garden.

The following contributions were announced :—

1.—Report on the extent and nature of the Sanitary Establishments for European Troops in the Bengal, Madras, and Bombay Presidencies. Presented by the Government of India.

2.—The Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. 19, Part 1. Presented by the Society.

3.—Memoirs of the Geological Survey of India—*Palæontologia Indica*. Presented by the Government of India.

4.—Report on the Administration of the N. W. Provinces for 1860-61. Presented by the Government of India.

5.—A small quantity of Australian Pine Seeds. Presented by Dr. David Scott.

6.—A case of Araucaria plants from the nursery of Mr. Guilfoyle, of Sydney. Received through J. C. Wilson, Esq.

These have arrived in good condition.

7.—Cuttings of a fine kind of Poplar from Simla. Presented by Lieut. J. F. Pogson.

The following is extract of Mr. Pogson's letter :—

"I have by this day's bangy dawk despatched to your address 80 cuttings of the gigantic, or wild Himalayan Poplar, which I trust will reach you safely. The cuttings have been put in a one-pound tin canister, having moistened moss at the bottom—the top was then filled in with more moss,

(also moistened) and the cover put on, and sealed down with sealing-wax; so I hope the cuttings will arrive in a perfect state of preservation. I enclose a dried leaf of this beautiful poplar, and, for comparison, I also send a dried black poplar leaf. In July 1854, I put down a cutting of this poplar, the tree is now 28 feet in height, and eight inches in diameter, at three feet from the ground. I am most anxious to get this tree introduced into Bengal, and I think it would thrive on Parisnath Hill. Poplar charcoal is, as you know, exclusively made use of in the manufacture of gunpowder in England; in this country, urhur dall stalk is subjected to the retting process, and afterwards made into charcoal. No gunpowder manufacturer, in England, would look at such rubbish in the shape of charcoal; in India, however, there is nothing like bean-stalk charcoal for making gunpowder. The powder made from this charcoal has recently been in the *Gazette*, as worthless at any range exceeding 300 yards. Modern rifles are sighted and warranted to kill, or hit an object aimed, at three times this distance. Now, unless we make better powder, all our ball'd ammunition must come from England, and a pretty penny it will cost. I hear Government intend to import machinery to work their powder mills: this is a move in the right direction, but unless the best materials are selected, no amount of mixing will turn out a first-class gunpowder. Government will no doubt find it more economical to import pure sulphur, instead of an impure article requiring final purification in India—but where is good charcoal to come from, for without it good gunpowder cannot be made. Under these circumstances, I think our hill poplar and willow charcoal should be tried, and if the powder produced from such charcoal is equal to English gunpowder, then bean stalks must be given up, and true wood charcoal be alone made use of. In order to have a supply of good poplar and willow charcoal, Government will have to form, and keep up plantations; and a better site than Parisnath could hardly be found for them.

“The cuttings I have sent, will, if they take root, form a small plantation, and, if necessary, any number could be sent down in the rains. I have read somewhere that charcoal made from dead wood, or wood well soaked in water, never could be made into good charcoal. Yet the “Urhur Dall” stalk is retted before being made into charcoal. Need we be surprised at Government gunpowder being unfit for modern fire-arms.”

These cuttings have reached in fair order, and been put down in pots under glass.

8.—Samples of Cotton raised at Gya from New Orleans seed, by E. F. Lantour, Esq. Received through Messrs. Hillanders, Arbuthnot and Co. (Referred to the Committee.)

Messrs. R. C. Lepage and Co. submitted, on behalf of the Patentes Mr. B. Barn, of Edinburgh, a cotton roller gin, for the inspection of the Meeting and opinion of the Committee. (Referred to the Machinery and Cotton Committees conjointly, for report.)

Mr. J. H. Gouldhawke submitted an improved instrument for weeding. "The improvements consist in having the blade rivetted on to allow of its being changed when worn out; and the rivet on the handle, instead of the twisted nail-like fastening that hurts the hand; and a steel edge." These are procurable at six annas each.

For the above communications and presentations, the best thanks of the Society were accorded.

(Wednesday, the 12th February, 1862.)

A. Grote, Esq., President, in the chair.

The Proceedings of the Anniversary Meeting were read and confirmed, and the gentlemen then proposed were elected Members, *viz.* :—

Messrs. P. J. Delauney, R. H. G. Matthews, Henry Mead, W. G. Howard, Edwin Hudson, J. P. Sagrandi, Nichol Macnicol, and H. A. Aubert.

The names of the following gentlemen were submitted as candidates for election :—

Lieutenant J. A. Dolimaye, Police Corps, Cuttaek,—proposed by Mr. Grote, seconded by Mr. Griffiths.

Walter Thomson, Esq., Behen, Shahabad,—proposed by Dr. J. B. Barry, seconded by the Secretary.

Captain G. E. Leggett, H. M.'s 77th Regiment, Hazareebaugh,—proposed by Lieut.-Colonel the Hon'ble A. Chichester, seconded by the Secretary.

Captain J. G. Skene, H. M.'s 77th Regiment,—proposed by Lieutenant-Colonel the Hon'ble A. Chichester, seconded by the Secretary.

H. Reinhold, Esq., Merchant, Calcutta;—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

C. Marquard, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. Creswell.

Koorwar Harendra Krishna, Calcutta,—proposed by Mr. Grote, seconded by Baboo Peary Ghand Mittra.

G. W. Barrett, Esq., Shahpore factory, Arrah,—proposed by Mr. J. S. Elliot, seconded by the Secretary.

Horti-Floricultural Exhibition.

Read the following reports of the judges respecting the show of vegetables, fruits, and flowers held in the Auckland Garden, on the 29th January 1862 :—

" Horticultural.—Considering the long continued rains of the past season, and the heavy falls experienced in the middle of October and the early part of November, this first show of the year, though not equal to some of its predecessors, was certainly very creditable in every respect to the native gardeners.

" Of the Brassica tribe, the Early York, Battersea, Savoy and red Cabbages showed well formed heads, firm and compact. The Cauliflowers, though less in quantity, were perhaps equal in quality to previous years. Some good specimens of Scotch Kale and Brocoli were also submitted.

" The collection of Carrots was good, both the "early horn" and "long" kinds.

" The best specimens of Celery were of private growth, but the collection was altogether small.

" The Turnips were tolerably well represented, especially the flat American

" The assortment of Potatoes was excellent—perhaps as good as at any previous show ; they were principally from native gardens.

" The stock of Lettuces was scanty, but some good baskets were brought forward.

" Of Peas, the Imperial, Prussian, Blue and Marrowfat, were well grown a few fair specimens of the Victoria pea were likewise introduced.

" Besides other foreign vegetables, such as leeks, onions, radishes, beans artichoke, nolo kole, &c., there was a fair display of native produce in this department.

" The collection of fruits was altogether scanty, but it included several good baskets of sapotas, guavas, long plums, and pomegranates.

" Four Bronze medals were awarded for the best specimens of Windsor Bean, Celery, Potato, and Turnip.

" The assemblage of gardeners was considerable. Prizes amounting to Rs. 320 were awarded to forty-eight, by S. P. Griffiths, Esq., F. P.

S. DOUGLAS.

PEARY CHAND MITTRA.

JOSEPH AGABEG."

" Floricultural.—As might have been anticipated, the show was a poor one : the collection of Roses was however tolerably good. From Rajah Pratap Chunder Sing's garden, to which the principal prize was given, fifty pots were sent in, consisting of fifteen kinds ; and the second prize was awarded

to the Tank Square garden for a collection of forty-two pots, consisting of fourteen kinds. Some fine cut specimens were likewise shown of rarer kinds from the gardens of Messrs. S. P. Griffiths and J. S. Elliot; including a perfectly new one called *Etandard des Amateurs* from Mr. Griffiths.

"A small, but pretty, collection of Ferns from Captain T. H. Tronson's garden was placed on the table, consisting of *Lycopodium* of three kinds; *Adiantum* of three kinds, *Davallia parvula*, *Ophioglossum vulgatum*, *Hemionites* species, &c. A few well-grown examples of *Olea fragrans* were introduced, and a few good Camellias. The only novelties were a plant of *Boehmeria* species, and another of *Calathea Zebrina* from the garden of Mr. Caridia and Baboo Kisory Chand Mittra.

"The produce of twenty gardens was brought forwarded, and prizes amounting to Rs. 93 were given to fourteen, as per list annexed.

A. GROTE.
S. P. GRIFFITHS.
C. B. STEWART.
J. SCOTT ELLIOT.
THOS. A. C. FERNINGER."

A report was submitted by the Officiating Gardener on the result of trial sowings of various descriptions of seeds presented to the Society during the latter part of last year.

The Council reported that they had elected the following members to their Sub-Committees:—

Finance.—Messrs. C. A. Cantor, Peary Chand Mittra, and S. P. Griffiths.

Papers.—Messrs. A. Grote, W. Haworth, S. H. Robinson, and Dr. Thomas Anderson.

Correspondence.—Messrs. A. Grote, W. G. Rose, and Stewart Douglas.

The Council further reported:—

First.—That they had fixed on Wednesday, the 26th February, for the second show of the season.

"*Second*—That they had agreed, in communication with the Garden Committee, to import a consignment of vegetable seeds from England, by Overland route, in lieu of the supply hitherto received from the Cape of Good Hope; that they had given another order for seeds of field crops and for flower seeds; that in respect to the latter, Messrs. Carter & Co. have been particularly instructed to adhere as closely as possible to the list sent for their guidance, which comprises, though rather smaller, yet a better selected assortment than that of last year. The usual order for vegetable seeds from North America had been given to Messrs. Landreth and Son, of Philadelphia.

Third.—The Council, lastly recommend that Mr. J. S. Elliot be elected at the next Meeting to fill the vacancy in the Council caused by the resignation of Mr. C. B. Wood, who has left for the Upper Provinces.

The following presentations were announced :—

1.—Selections from the Records of the Government of India, No. 29. From the Government of Bengal.

2.—Report of the Bombay Chamber of Commerce for 1860-61. From the Chamber.

3.—Annals of Indian Administration, Part 4 of Vol. V. From the Government of Bengal

4.—Report of the Bengal Chamber of Commerce, May to October 1861. From the Chamber.

5.—A collection of Orchids, from Moulmein. From Colonel Fytche.

6.—A collection of Orchids from Arracan. From A. L. McMillan, Esq.

7.—Two samples of Cotton raised at Akka. From H. R. Minchin, Esq.

8.—Two samples of Cotton from Umritsur. From H. Cope, Esq.

9.—Two samples of Cotton raised from foreign seed at Banda. From H. Dashwood, Esq.

10.—A sample of Cotton from Pernambuco seed raised at Penang. By Mr. T. G. Mitchell.

The above samples, with the various communications relating to them, were referred to the Cotton Committee.

(Wednesday, the 12th March, 1862.)

Baboo Peary Chand Mittra, senior member present, in the chair.

The Proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members, who were proposed at the last Meeting :—

Lieut. J. A. Dolinaye, Capt. G. H. Leggett, Capt. J. G. Skene, Messrs. Walter Thomson, H. Reinhold, C. Marquard, G. W. Barton, and Koomar Harendro Krishna.

The names of the following gentlemen were submitted as candidates for election :—

B. Kerr, Esq., Calcutta,—proposed by Mr. W. G. Rose, seconded by Baboo Peary Chand Mittra.

Dr. C. F. Tonnerre, Calcutta,—proposed by Mr. S. Douglas, seconded by Mr. C. A. Cantor.

J. M. Beecher, Esq. Naran Factory, Tirhoot,—proposed by Mr. James Forlong, seconded by the Secretary.

Mr. A. A. Ogg, Raneegunge,—proposed by Mr. Grote, seconded by the Secretary.

Frederick Peterson, Esq., Secretary Simla Bank,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Lieut.-Colonel H. D. Taylor, Nagpore,—proposed by Mr. J. S. Elliot, seconded by Mr. S. P. Griffiths.

T. H. Moseley, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

The following presentations were announced : —

1.—Selections from the Records of the Government of India, (Public Works Department,) No. 35. Presented by the Government of Bengal.

2.—Journal of the Royal Asiatic Society, Vol. XIX. Part 2. Presented by the Society.

3.—The Records and Annual Meeting of 1861 of the Agricultural and Horticultural Society of Madras. Presented by the Society.

4.—Annual Report of the Administration of the Bombay Presidency, for 1860-61. Presented by the Government of Bengal.

5.—Journal of the Asiatic Society of Bengal, No. 4 of 1861. Presented by the Society.

6.—The first Annual Report of the Agricultural and Horticultural Society of Oude. Presented by the Society.

7.—List of specimens of some of the woods of British Burmah sent to the International Exhibition. Presented by the Superintendent of Forests, Pegu and Tenasserim.

8.—A small collection of double Zinnia seed gathered at Lucknow. Presented by Dr. E. Bonavia.

9.—A small quantity of double Zinnia seed collected at Benares. Presented by R. H. Smith, Esq.

10.—A specimen of Joom dhan from Sylhet. Presented by Baboo Jodoo-nath Bose.

The following is extract of the Baboo's letter, dated from Sylhet, forwarding the above :—

“I have the pleasure of forwarding to you by to-day's dawk banghy a specimen of the *joom dhan* (joom, paddy or rice) cultivated by the Hill people on the North and South of Sylhet. The rice prepared from the *joom* form, among these people, the staple of food.

“Joom cannot be grown on the same piece of land on two successive years. An interval of about twenty years must be allowed to intervene before two

crops may be obtained from the same piece of land. This is the reason why these Hill people are generally observed to lead a nomadic life. They must every year find out new places for growing their joom. The following is the method, described to me by a gentleman, of cultivating the joom as it exists among the Kookees and Tipperahs inhabiting the South of Sylhet.

"Land which had been lying waste for about twenty years, has all the jungles covering it cut down during the latter part of December or the commencement of January. From the middle of January to the middle of February, the jungles thus felled are set fire to and burnt down to ashes. When the land is thus cleared, joom is sown from the middle of February to the middle of March.

"The mode of sowing is as follows: a hole is dug in the ground with a *dao*, and in it are put some five or seven seeds of joom, some four or five seeds of cotton, and some two or three of *chenar* or *teel* all together, and covered with earth.

"From the middle of March to the middle of May is the time for weeding the *khetts*, during which the Kookees prepare *mawhangs* or raised sheds, and from these watch their crops. In July the joom ripens and is fit to be reaped. During the months of August and September, the stubble is cut and stored. There are two kinds of stubble—the Boong or good, the Kotta or bad."

Baboo Peary Chand Mittra pronounced the above to be like a Burmese rice, and as not likely to come into general competition here, but it may be exported to Madras, Colombo, &c. The value may be estimated at Rs. 1-8 to 1-9 per bazar maund. The Baboo was requested to send a larger sample for a fuller report.

11.—A collection of plants and seeds and bulbs from South Africa. Presented by Captain W. H. Lowther.

Most of the bulbs and several of the plants have arrived in good order under Captain Lowther's supervision. The Secretary stated, that the seeds were already under distribution. He also submitted various interesting notes drawn up by Captain Lowther respecting some of the plants included in the above collection.

The best thanks of the Society were given to Captain Lowther for this most acceptable contribution. It was directed that the notes should be published in the Journal.

12.—Samples of cotton and sugar and a collection of orchids and other plants from Port Blair. Presented by Captain J. C. Haughton.

The following is extract of Captain Haughton's letter, dated the 28th January 1862 :—

"I have this day packed two specimens of Cotton, regarding which I shall feel favour by your obtaining opinions to be published with a report on

the result of our Cotton experiments here, which I will (D. V.) send you so soon as our cotton harvest is over. I also put up a jar of sugar for report. It has been prepared with the mucilage of the Okra in lieu of bullock's blood, eggs, or the article used by Hindoos, which is unobtainable here and the plant [the "Sheola," *Falisneria octandra*] you sent by Dr. Hayes, I regret to say, died before it reached me.

"The sugar seems to me very imperfect, but this is due in my opinion to the want of skill of the maker rather than to defect in the cane. The community here buy our own manufacture in preference to that imported from Calcutta, the price of both being the same.

"Whatever may be the report as to the quality of the Cotton I send you, there can be no doubt as to the profitableness of the article; as to quantity, the yield is equal already to 1,200 lbs. (if my calculations are correct) per acre; but as I have already said, I will give you a carefully considered report when the crop is all in.

"I have three cases of plants and heaps of orchids waiting for a ship, to go to you.

"Please, in returning the cases, put anything useful in them.

"The yam and other roots you sent have just been harvested. Unfortunately the Chinese gardener put them down without the names. That which I take to be most successful is, I think, *Dioscorea fusciculata*; it affords a pleasing change from the ordinary roots, a matter of no small importance when potatoes are at Rupees 14 per basket, the latest quotations here. I shall therefore be glad of any thing new in this line."

In a subsequent letter of the 6th February, Captain Haughton adds—

"The box now sent contains samples of our Chinese, Shaker, Misree, and Cotton. I have written already, and shall be glad if you are able to get opinions on the cotton ready for the report I send *as soon as the harvest* is completed. You will observe that one packet is from the plants grown last year from New Orleans seed, which have been allowed to stand; and the second packet is from plants of this year from the seed of the crop of last year. This mention is sufficient to indicate the interest attached to them."

The samples were referred for report to their respective Committees.

13. Sample of cotton raised at Ellengurje Grant, Mutlah, from Egyptian seed. Presented by Messrs. John Borradaile and Co.

Referred to the Cotton Committee.

HORTI-FLORICULTURAL EXHIBITION.

Read the following reports of the Judges at the Second Show of the season held in the Auckland Garden, on the 26th of February 1862:—

• HORTICULTURAL.—The second show of the season may be considered

as altogether a good one. There was not so large a display of produce as at the first show, but the quality was very fair.

"The artichokes were very well represented—a marked improvement on previous shows. Cabbages of sorts (Savoy, Battersen, Early York, and Drumhead) were good, and so were brocoli, beet (both long and turnip rooted), carrots, endives (well blanched), potatoes, and turnips. The celery, both from public and private gardens, was good.

"Of Cauliflowers very few baskets were submitted, and these of an inferior kind. The asparagus was poor, being too early in the season. The collection of peas was very good—principally from private gardens. The beans were also better than heretofore, especially the long pod.

"Besides these, lettuce of sorts, nolo kole, leeks, onions, parsnips, squashes, &c., were submitted for competition, and prizes were awarded to the best specimens of each. Some good specimens of Scotch Kale and Sea Kale were also introduced to notice.

"The usual collection of native vegetables was submitted.

"In the fruit department there were a few good specimens of strawberries, and several baskets of fine sapotas. Pomegranates, loquots, guavas, bale, pummelows, pine apples, plums, and a few other kinds of fruits were exhibited, but none calling for particular notice.

"There was a good competition. Prizes amounting to Rs. 256, and three bronze medals for the best specimens of celery, potato, and turnip, were distributed to fifty gardeners by S. P. Griffiths, Esq., Vice-President.

S. DOUGLAS.

JOSEPH AGADG."

"**FLORICULTURAL.**—Though not equal to some of its predecessors, this show was tolerably good; about the same as the second exhibition of last year.

"The collection of roses was less than at the first show, but it was nevertheless pretty fair.

"The Pelargoniums were not so well represented as on several previous occasions, but there were a few well-grown specimens in flower of the rarer kinds.

"In the department of bulbs, several fair plants of ranunculus, anemones, hyacinths, narcissus, &c., were placed on the stands.

"There were good collections of pinks, begonias, oxalis, verbenas, portulacas, phloxes, and stocks.

"The miscellaneous collection comprised some well grown examples of *Linum grandiflorum*, *Whitlavia*, *Antirrhinum*, *Pentstemon*, daisies, and double Zinnias.

" A few finely flowered specimens of *Euphorbia jacquiniflora*, *Francisceas* of three kinds, and *Stephanotis floribunda* were introduced.

" The collection of Orchids was very meagre; but there were some good plants of *Bletia hyacinthina*.

" Among the few ferns was a handsome specimen of *Lycopodium bicolor*, and a pretty plant from the Neilgherries.

" One solitary Fuchsia in flower was submitted. Among the few novelties was an *Arum* from South Africa.

" The attendance of visitors was great. The produce of twenty gardens was submitted, and prizes amounting to Rs. 145 were distributed to seventeen gardeners by Rajah Pertabelunder Sing.

A. GROTE.
S. P. GRIFFITHS.
C. B. STEWART.
J. SCOTT ELLIOT.
T. A. C. FIRMINGER."

Submitted reports from the Cotton Committee (Messrs. Douglas, Haworth, and FitzWilliam) on sundry samples recently submitted from Gya, Banda, Aska, Umritsur, and Penang. Ordered that copies be sent to the persons interested, and that the report be published in the Journal.

Submitted the following recommendations from the Council.

First.—That the Third Show of the season be held on Tuesday, the 15th of April, at the Town Hall.

Second.—That the pay of the Second Writer in the Secretary's Office be increased from Rs. 26 to 30 per mensem.

Third.—That the Secretary's application for a year's leave of absence to England, commencing from June or July next, be complied with; the duties to be conducted in the interim by Mr. S. H. Robinson.

The above recommendations were agreed to.

Read a letter from Dr. Thomson, announcing the departure of Mr. Robert Errington, whom he has selected as Head Gardener of the Society. Mr. Errington has since arrived, and taken charge of the garden. The best thanks of the Society were given to Dr. Thomson for the trouble he has taken in executing this commission.

(Wednesday, the 9th April 1862.)

A. Grote, Esq., President, in the chair.

The proceedings of the last Meeting were read and confirmed, and the following gentlemen elected Members :—

Dr. C. F. Tonnerre, Messrs. R. Kerr, J. M. Becher, A. A. Ogg, F. Peterson, T. H. Moseley, and Lieut.-Colonel H. D. Taylor.

The names of the following gentlemen were submitted as candidates for election :—

William Minto, Esq., Tea Planter, Jorchant,—proposed by Mr. T. E. Carter, seconded by Mr. R. Blechynden.

The Secretary of the Government Gardens, Rawul Pindee,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Captain J. R. Martin, Executive Engineer, Gornackpore,—proposed by Captain C. C. Drury, seconded by the Secretary.

C. B. Jennings, Esq., Sylhet,—proposed by Major A. F. Baird, seconded by the Secretary.

Captain Wilkinson, 7th Hussars, Umballah,—proposed by Dr. F. J. Mouat, seconded by Mr. Grote.

Dr. B. W. Saitzer, Civil Surgeon, Shajehaupore,—proposed by Dr. A. H. Hilson, seconded by the Secretary.

The following contributions were announced :—

1.—Memoirs of the Geological Survey of India, *Palæontologica Indica*—The Fossil Flora of the Rajmahal Hills. Presented by the Government of India.

2.—Official, Classified, and Descriptive Catalogue of the Contributions from India to the London Exhibition of 1862. Presented by the Government of Bengal.

3.—The Tenth Annual Report of the British Indian Association. Presented by the Association.

4.—Sundry samples of Cotton raised at Lucknow from New Orleans, Egyptian, and indigenous seed. Presented by Dr. Bonavia. (Referred to Committee for report.) Dr. Bonavia's interesting and full report of his trials is included in the returns submitted from various parts of India.

5.—Three hundred samples of cereals, pulses, seeds, oils, &c. the surplus of natural products forwarded from various parts of India for transmission to the London Exhibition. Presented by the Government of Bengal.

6.—A few roots of country carrots of a large size, grown at Ramcollah Factory, Chuppra. Forwarded by J. F. Curtis, Esq. "They are not very beautiful to look at," observes Mr. Curtis, "but I send them on account of the extraordinary size to which they have grown—one of them weighing upwards of 8 lbs. on being taken out of the ground. They are grown in a sandy soil, and dug out about 750 maunds to the beegah of 32,000 feet."

REPORTS.

Read the following report of the Cotton Committee on Mr. George MacDonald's roller gin :—

"Referring to their report on Mr. George Macdonald's Roller Gin, which was submitted at the Monthly General Meeting held on the 9th October last, and to the resolution of the Meeting thereon, which was duly communicated to Mr. Macdonald, your Committee now beg to append the following copy of a letter addressed by him to the Secretary :—

" 'The improvements in the Cotton gin I now submit to the Cotton Committee of your Society, for trial and report, over my last Gin, are as follows :—The roller is made of jute, forming an easy and elastic surface to receive the cotton without any injury to the staple, and whose capability of cleaning the cotton will not be diminished by use. This fibre approaches so nearly to the texture of cotton itself that it is less likely to do any injury to the staple than any other substance that could be used. The doctor which presses against the roller, and between which and the roller the cotton has to pass, is manufactured from the best spring brass; the oscillating blade is also made of brass. These are the only two metallic substances which touch the cotton in the process of being cleaned. Their being made of brass, I conceive to be a great advantage over iron or steel, in as much as brass does not rust and is not so harsh as iron. The horizontal movement of the oscillating blade works on centres, this arrangement admits of very accurate adjustment. The blade itself is toothed, which for most kinds of cotton I consider to be advantageous, as it does not strike the whole of the cotton away at once from the bite of the roller, as it passes up over the doctor. The shape of the teeth are such as to separate the seed from the cotton without injury to either. The driving gear of the gin is made with a view to the easy working of the machine, one man being sufficient to drive it. With the exception of these alterations, the general principle of the gin is the same as the last machine I submitted to your notice.'

"Your Committee met on the 7th ultimo, for a preliminary trial, and again on the 1st instant, and now beg to report as follows :—

“ The machine was tried on the first occasion with a *toothed* blade ; and on the second, with a *plain* blade. The same description of *Kupas* was used both times, *viz.* *New Orleans*, raised at Bhangulpore ; and the same quantity, was cleaned each time, *viz.* a tola, per minute, equivalent to about eighteen pounds avoirdupois in a day of twelve hours.

“ The cotton was very well cleaned, without the slightest injury to the staple ; but that cleaned with the plain blade is rather better than that with the toothed blade ; and as the latter is more liable to get out of order, and is more expensive in manufacturing, the plain blade is to be preferred.

“ The substitution of *Jute* for *Cocoa-nut fibre* as a covering for the roller, your Committee conceive to be a decided improvement and far preferable to the *leather* roller of Dunlop's machine. The substitution of brass for iron for the fixed and oscillating blades, is likewise an improvement, for the reasons given by Mr. Macdonald.

“ Altogether, without venturing on a decided opinion as to the employment of a *roller gin* in substitution of a *saw gin* for New Orleans and other kinds of short stapled cotton, your Committee are of opinion that this machine of MacDonald's is the best of the kind that has yet been submitted to the notice of the Society.

WM. HAWORTH.

S. DOUGLAS.

Resolved, that this report be published in the proceedings, for general information, and that a copy of it be sent to Mr. MacDonald.

Read another report from the Committee on sundry samples of cotton from Upper India, Behar, Bengal, and the Andamans. Ordered, that copies be sent to the persons interested, and that the report be published in the Journal.

Read report from the Sugar Committee on the samples of sugar from the Andamans, which were submitted at the last Meeting. Ordered, that a copy be sent to Captain Haughton, for his information.

The Secretary placed on the table reports from various persons, in respect to the result of their sowings of the cotton seed placed last year at the Society's disposal by the Manchester Supply Association. Ordered, that these reports be published in the Journal, and a copy supplied to the local agents of the Association.

The Secretary also submitted returns of trial sowings of field crop seeds during season 1860-61, of which a tabular statement had already been sent to the Government of Bengal. Ordered, that this be likewise inserted in the Journal.

Amendments of the Bye Laws.

The Council desired, in accordance with the provisions of Chapter XIX of the Bye Laws, to recommend, for the consideration of the next Meeting, the following amendments of the Bye Laws, which they deem to be necessary, in consequence of the registration of the Society under Act XXI of 1860 :—

Chapter III., Section 3.—Addition proposed after the words “Bye-Laws,” “and a printed letter to be duly signed and returned, acknowledging the receipt of their election as Members, and agreeing to consider themselves bound by the Bye-Laws.”

Chapter III., Section 5.—The three first lines to be omitted.

Chapter III., Section 7.—The following proposed in substitution of this section.

“When any Member shall be six months in arrear of his subscription, or otherwise indebted to the Society, he shall receive the usual ordinary notice of the same; and in the event of his not remitting the amount within one month if a Town Member, and two months if a Non-resident Member, he shall be apprised by letter, addressed to his last known place of residence, that unless the amount due by him be paid within fifteen days from the date of notice if a Town Member, and one month if a Non-resident Member, he will be liable to be sued, or his name published as a defaulter. He shall, moreover, be debarred from all the privileges of a Member if six months in arrear, until the amount due by him is paid. Persons not paying after such notice shall cease to be Members.”

Chapter IV., Section 1.—The following addition between the words “his” and “name” in the fourth line :—*viz.*, “being sued, or his”

Chapter V., Section 5.—This Section to be altogether omitted, as it has not been found to work harmoniously with Section 7 of Chapter III, as at present constituted.

Submitted papers from Dr. J. B. Barry, regarding the culture of the Tea plant as pursued in Assam and Cachar, and from Mr. A. G. Murray on Steam Irrigation for India. Transferred for publication in the Journal.

For the above communications and contributions, the best thanks of the Society were accorded.

(Wednesday, the 14th May 1862.)

A. Grote, Esq., President, in the chair,

The proceedings of the last meeting were read and confirmed, and the following gentlemen elected members :—

Messrs. William Minto, C. B. Jennings, the Secretary Government Gardens, Rawul Pinde, Captain J. R. Martin, Captain Wilkinson, and Dr. B. W. Switzer.

The names of the following gentlemen were submitted as candidates for election :—

E. Dyer, Esq., General Manager, Murree Brewery Company,—proposed by Major H. C. Johnstone, seconded by the Secretary.

G. W. Moultrie, Esq., Banker, Mirzapore,—proposed by Mr. C. E. Creswell, seconded by Mr. J. S. Elliot.

A. D. Dunne, Esq., Indigo Planter, Dacca,—proposed by Captain E. Wintle, seconded by the Secretary.

R. L. Mangles, Esq., C. S., Tipperah,—proposed by Captain Wintle, seconded by the Secretary.

G. F. Browne, Esq., C. S., Tipperah,—proposed by Captain Wintle, seconded by the Secretary.

H. Stainforth, Esq., C. S., Calcutta,—proposed by Mr. Grote, seconded by Mr. S. Douglas.

J. E. Todd, Esq., Tea Planter, Novacacharree Factory, Jorehaut, Assam,—proposed by Mr. S. H. Robinson, seconded by Baboo Peary Chand Mittra.

T. H. Bennertz, Esq., Merchant, Calcutta,—proposed by Mr. W. G. Rose, seconded by the Secretary.

The following contributions were announced :—

1.—Several volumes of the Patent Office Report, from 1855 to 1859; of the Transactions of the Ohio and Michigan Agricultural Societies; and of the Smithsonian Report from 1856 to 1859. Presented by the Smithsonian Institution at Washington.

2.—Annals of Indian Administration, Part 1 of Vol. VI. Presented by the Government of Bengal.

3.—Third Report of the Committee of the Mutlah Association. Presented by the Committee.

4.—A Lecture on the Cotton Trade, by the President of the Glasgow Chamber of Commerce. Presented by Messrs. Mackinnon, Mackenzie and Company.

5.—Journal of the Asiatic Society of Bengal, No. 1, 1862. Presented by the Society.

6.—A collection of Orchids from Upper Assam. Presented by G. W. Wagentricber, Esq.

7.—A small glazed case containing test samples of Cotton. Presented by Messrs. Moseley and Hurst.

8.—A sample of Cocoons of *Bombyx Mori* from acclimatized Cashmere stock. From C. Moyne, Esq.

Mr. Moyne offers a few remarks respecting these Cocoons, in the following extract of his letter, dated 12th April :—

“I have shewn to you, last year, some silk cocoons obtained from Cashmere seeds sent to me by Mr. H. Cope from Umritsur. These worms have been cross-bred with the small Bengali worm. After a great deal of perseverance, I have succeeded in acclimating these worms in Bengal; and I send you a specimen of the cocoons obtained. They do not thrive so well in the hot months, but still they give a fair result. Eight to ten kaons of these cocoons produce a scer of silk (bazaar weight of 80 tolahs), that silk is also much superior to the best Bengal silk.

“These last two years I have made expensive experiments to try to acclimate this breed of Cashmere. I find that they give two good crops till the end of April; the third crop in May and June is indifferent, but the cocoons produced in August are better, and the next cold weather the cocoons are just as good as those produced from the pure Cashmere breed. The accompanying cocoons will be the best proof of this fact.

“Mr. Cope has not been able to send me a supply of seeds this year; but I intend to apply to that gentleman for a fresh supply in December next. I believe the Bengal silk-worm might be greatly improved by being yearly cross-bred with the Cashmere silk-worm.”

These cocoons are of a superior description.

HORTI-FLORICULTURAL EXHIBITION.

The following reports of the Judges on the show, held in the Town Hall, on the 16th April, were submitted :—

HORTICULTURAL.—As was to be expected, the assortment on this occasion was limited, but there were, nevertheless, some good samples of vegetables, of artichokes especially, the culture of which appears now to be annually improving. The asparagus too was good. Carrots and potatoes excellent; turnips pretty fair. Cabbages of sorts were likewise well shown, especially the more delicate kinds. The celery was indifferent in consequence of the advanced season. Several well grown baskets of beans (Lina and French) were submitted,

There was a pretty fair collection of fruits, including sapotas, pomegranates, loquats, strawberries, bael, and rose-apples; a few ripe peaches and nearly ripe mangoes.

The assortment of native vegetables was limited.

About one hundred and fifty gardeners were present, to thirty of whom prizes were given to the amount of Rs. 180, and three medals.

S. DOUGLAS,
JOSEPH AGABEG,
PEARY CHAND MITTRA.

FLORICULTURAL.—The orchids and bulbous plants formed the chief attraction at this show. Though, perhaps, the collection of orchids was not equal to that submitted at more than one previous exhibition, yet it was very fair, and prizes to the amount of Rs. 38 were given to eight of the ten gardens which competed for the largest collections and best specimens. Several fine plants of *Phalænopsis amabilis* and *Renanthera coccinea* were conspicuous. Besides these were good examples of *Vanda Roxburghii*, *Oncidium luridum*, *Ærides multiflorum*, and *Saccolabium guttatum*, and specimens of *Dendrobæ*, *Vandas*, *Cymbidium aloifolium*, *Ærides affine*, *Saccolabium rubrum*, *Camarotis purpurea*, *Epidendrum crassifolium*, and a few others. Among the bulbous tribe were some good plants of *Amaryllis*, *Gladioli*, and *Gloxinias*. Among other plants which were placed on the stands, may be enumerated *Ixoras* of three kinds: *Allamanda nereifolia*, *Rhyncospermum jasminoides*, *Stephanotis floribunda*, *Globba subulata*, *Dischidea lanceolaria*, and a new variety of *Hoya*, of all which there were good examples.

The produce of fifteen gardens were brought forward, and to eleven of these prizes amounting to Rs. 135 were awarded, which were distributed by the Rev. T. A. C. Firminger.

There was but a limited attendance of visitors.

A. GROTE,
J. SCOTT ELLIOT,
W. STALKART.

COTTON.

A report was submitted from a Section of the Committee (Messrs. Haworth and Douglas,) on certain samples of Cotton recently received from Oude; and it was agreed that copies be sent to the persons interested.

The Secretary placed on the table fifty extra copies, from the forthcoming number of the Journal, of the report on the results of the sowing of the exotic cotton seed distributed last year as received from the Manchester Supply Association, whereupon it was *Resolved* that some copies be transferred to Messrs. Moseley and Hurst, the Local Agents of the Association, and the remainder distributed to those who had furnished reports.

The Secretary announced that Messrs. Moseley and Hurst had transferred, last month, to the Society, a quantity of cotton seed just received from

Egypt, for which applications were being received daily. The Gardener reports that a trial sowing of this seed has afforded a germination of 75 per cent.

It was also announced that four Essays had been sent in to compete for the prize of 1,000 rupees, conjointly offered by the Society and the Manchester Association, for an approved essay on the culture of foreign cotton in India from foreign seed, and it was agreed that, as recommended by the Council, a *Special Committee*, consisting of the following gentlemen, with power to add to their number, be nominated to examine and report on these essays:—*viz.* Messrs. A. Grote, W. Haworth, S. H. Robinson, W. S. FitzWilliam, and S. Douglas.

AMENDMENT OF BYE-LAWS.

The Meeting next took into consideration certain amendments of the Bye Laws, of which due notice was given at the last Meeting. Each section proposed for amendment was read separately and carried unanimously.

PATRON OF THE SOCIETY.

The President submitted a letter from the Private Secretary to His Excellency the Governor-General, in reply to his communication expressive of the wish of the Council that His Excellency would be pleased to accept the office of Patron of the Society. Mr. Thurlow states that "the Governor-General will not encroach on the valuable time of the Council and Members of the Agri-Horticultural Society by receiving the deputation which the Association is anxious should wait upon him. The Governor-General has, however, instructed me, in enclosing the accompanying donation of five hundred rupees, to beg you to express to these gentlemen the gratification which it affords His Excellency to have it in his power to promote the interests of the Society over which you preside."

RECOMMENDATIONS FROM THE COUNCIL.

The Council submitted the following recommendations:—

1st.—That Mr. William Haworth be recommended to fill the vacant office of Vice President caused by Mr. S. P. Griffiths' departure from India.

2nd.—That Mr. Joseph Agabeg be recommended to fill the vacancy in the Council caused by the previous recommendation.

(The above recommendations to be re-submitted at next meeting, in accordance with the provision of Chapter X., Section 5 of the Bye-laws.)

3rd.—That Mr. Hayes be appointed, on trial, as Assistant Gardener and Clerk to the Head Gardener, on a salary of Rs. 16 per mensem. Agreed to.

Letters were read from the Secretary Smithsonian Institution, Washington, returning thanks for certain publications of the Society, and from

Messrs. James Carter and Company, of London, acknowledging receipt of order for vegetable, flower, and field-crop seeds, and promising to give it their most careful attention.

(Wednesday, the 11th June 1862.)

A. Grote, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed, and the following gentlemen elected members :—

Messrs. E. Dyer, G. W. Moultrie, A. D. Dunne, R. L. Mangles, C. S., G. F. Browne, C. S., H. Stainforth, C. S., J. E. Todd, and T. H. Bennertz.

The names of the following gentlemen were submitted as candidates for election :—

Captain A. K. Comber, Assistant Commissioner, Tezporc, Assam,—proposed by Captain W. H. Lowther, seconded by Mr. Grote.

Captain W. Elwyn, Cantonment Magistrate, Peshawur,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Captain the Hon'ble A. Stewart, R. H. A.,—proposed by Mr. Grote, seconded by Mr. S. Douglas.

C. S. Rundle, Esq., Civil Engineer, Monghyr,—proposed by Mr. H. E. Braddon, seconded by Mr. R. Blechynden.

The Secretary Station Garden Committee, Peshawur,—proposed by the Secretary, seconded by Mr. Rose.

Nawab Nazeer Ally Khan, Bahadoor,—proposed by Mr. Joseph Agabeg, seconded by Mr. Grote.

The following contributions were announced :—

1.—A Collection of Treaties, Engagements, and Sunnuds relating to India and neighbouring countries, Vol. I. Presented by the Government of Bengal.

2.—Report on the extent and nature of the Sanitary Establishment for European Troops in India, 1862. Presented by the Government of India.

3.—Report on the Province of Oude, by P. Saunders, Senior. Presented by the Author.

4.—Memoirs of the Geological Survey of India, *Palæontologia Indica*, 2.1. Presented by the Government of India.

5.—Report of the Conservator of Forests (Madras Presidency) for 1860-61. Presented by the Government of Bengal.

6.—Samples of cotton (second crop) from New Orleans seed sown at Lucknow, and sample of cotton from Berar seed. Presented by Dr. E. Bonavia.

7.—Sample of cotton from selected indigenous seed grown at Delhi. Presented by L. Berkeley, Esq.

8.—Samples of Cocoons of the Mulberry worm reared by Meer Jaffer Allee, of Dereah, Goordaspore, Punjab. Presented by H. Cope, Esq.

9.—A minute sample of silk from a wild worm at Simla. Presented by Lieut. J. F. Pogson.

10.—Samples of cloth, silk, and flannel dyed with a green vegetable dye; also sample of oil from the seed of the same plant. Presented by Dr. R. F. Thompson, Civil Surgeon of Malda.

11.—A quantity of acclimatized cauliflower seed. Presented by Dr. Bonavia.

(Particulars respecting the above samples will be found in the body of the Proceedings.)

The recommendation of the Council submitted to the last Meeting, that Mr. Haworth fill the vacant office of a Vice President, and Mr. Joseph Agabeg the vacancy in the Council, was again brought forward and unanimously agreed to.

COTTON.

Read two communications from Dr. Bonavia, of Lucknow, respecting the cotton samples before referred to. (See body of the Journal).

The Secretary mentioned that, in the opinion of Messrs. Douglas and Haworth, members of the Committee, the summer crop of New Orleans cotton is fully equal to the winter crop, which they had previously reported on so favorably (Journal, Vol. XII. page 261), and that there is no difference perceptible between the cotton in the four and five-valved bolls; the result is altogether very encouraging. In respect to the third sample raised from the seed (probably of *Gossypium arboreum*) which Captain Davis had sent last year to the Society, the Committee are of opinion that it is a decided improvement on the original stock, which was reported on in April 1861, (Journal, Vol. XII. page 125,) the color being equally good, and the fibre soft and silky, instead of being harsh like the sample received from Captain Davis; the extended culture of this description of cotton in Oude might therefore be desirable.

Read a note from Mr. Berkeley in reference to his sample of indigenous cotton.

"I have now the pleasure," writes Mr. Berkeley, "to send a sample of the cotton I wrote to you about, raised from picked indigenous seed; no particular care was taken in its cultivation, but it was carefully picked and ginned. I have four maunds like this sample; I should like to know if it is any better than the ordinary Indian cotton, or whether picking and sowing the best seed has not improved it."

The Secretary mentioned that this cotton is considered an excellent sample, in every respect, of indigenous stock, showing that the care bestowed in sowing picked seed and in plucking and ginning, had had a decidedly beneficial effect.

Read a Memorandum by Major J. C. Haughton on his experiment at Port Blair with New Orleans cotton. (See body of the Journal).

SILK.

Read the following letter from Mr. H. Cope, of Umritsur, dated the 16th of May, and submitted the report therein alluded to. A previous correspondence on this subject is published in the August Proceedings of 1860, (Journal, Vol. XI., page 53).—

I do myself the pleasure to enclose copies of letters regarding the value of the silk reared by me in 1860 and reeled by Mr. Turnbull, of Guttaul, through your good offices, which I shall be obliged by your submitting to the next meeting of the Society.

To

L. BOWRING, ESQ.,

Secy. to the Govr.-Genl. of India, Calcutta.

*Office of Committee of Privy Council for Trade,
Whitehall, Feb. 21th, 1862.*

SIR,—I am directed by the Lords of the Committee of Privy Council for Trade, to inform you that on the receipt of your letter of the 13th September last year, the correspondence of Mr. Cope, together with specimens of the silk produced by Mr. Cope at Umritsur, were forwarded to the Chambers of Commerce of Manchester, Coventry, and Macclesfield, being the towns where silk industry is principally located, with a request that they would furnish this Board with a report as to the value of such silk in English markets as an article of commerce.

I am now to enclose a copy of a report which has been received from the Manchester Chamber of Commerce, and to request that, in laying the same before His Excellency the Governor-General, you will state that the further reports which are expected shall follow as soon as they are received.

I am, &c.,

(Signed) J. EMERSON TENNANT.

To

SIR J. EMERSON TENNANT,

Board of Trade, Whitehall, London.

Manchester Chamber of Commerce, Feb. 20th, 1862.

SIR,—In reply to your letter of November 8th, 1861, accompanying certain samples of silk, the produce of the Punjab, respecting which the Lords' Committee of Privy Council for Trade were desirous of obtaining

the opinion of this Chamber, I have now the honor to acquaint you that the samples having been submitted to some of our leading silk manufacturers, they have had it passed through the machinery and report as follows :—

‘The silk is very well and carefully reeled in every respect; the thread is clean, round, and uniform in size, well laid on the reel, and the hank a convenient size. It winds well and passes through the other operations of throwing in a satisfactory manner.

‘Its elasticity is about one in six equal to good China.

‘It makes organzine of 23 D.

‘If the silk can be supplied in quantity in every respect equal to sample, I consider it worth 25 shillings per lb. in the present state of the market. If not as well reeled as sample, its value would be much diminished.

(Signed) ROBERT C. SHARP.’

I may further observe that the sample of yellow silk has been valued at very nearly the same amount.

I have, &c.,

(Signed) HUGH FLEMING,

Secretary.

Read also extract of a letter from Lieut. J. F. Pogson, of Sinla, dated 4th May, respecting the minute sample of raw silk already referred to, which though beautifully fine, is too small to be reported on :—

“I enclose for submission to the Society, a sample of silk reeled off *from a live silk-worm*. The worm was discovered by me, in April, on one of my mulberry trees. It feeds on the mulberry, and will feed in confinement. To look at the worm is exactly like a mulberry branch or twig, about to bud, so like, in fact, that a branch from which I gathered five of them, did not appear at first sight to have any. The longest worm I found was $2\frac{1}{2}$ inches in length. Its diameter at base $\frac{3}{12}$ th of an inch; ditto at neck $\frac{2}{12}$ th. The worm has two pair of legs near the vent, with these it attaches itself to a branch. It then fixes its silk to the branch some two inches above its hind feet, and then throws itself back off the branch—the body taking the same angle as a growing twig. It always keeps two of its fore-feet on the silk which it has attached to the branch, and the other four remain unemployed. In confinement, it attaches itself to the net, and feeds only at night. Curiosity induced me one day to see how much silk it would give off. I, therefore, took up the filament it had attached to the net, and quietly and gently wound it off on the bit of blue paper enclosed. After this quantity was wound off the supply ceased, *next day* the worm was sick, and yesterday it had turned into a chrysalis, *without spinning* any silk about itself, whilst two other worms,

which had not been deprived of the silk existing in their systems, spun cocoons, which are more like net-work bags than any thing else.

"I do not think this worm will turn out of much use, though if we could perch five at a time on a twig, and reel off five filaments at once, a stout silk of moderate length might be obtained. The silk is very brilliant, and must be strong for so long a worm to hang by. I have thrown a net over the tree on which these singular worms were found, and as this keeps off birds, the breed will be saved."

A note from Mr. Cope in reference to the cocoons of the mulberry worm previously alluded to, from Jaffer Allee (to whom the silver medal of the Society was presented in 1858), was likewise read:—

"Jaffer Allee, of Goordaspoor, has just come in to sell his annual crop of silk, and brought a few prime cocoons with him. They are so fine that I have thought it worth while to send you a small number for the inspection of your Silk Committee and of the Society. A few millions of these would soon establish the credit of Punjab silk beyond all controversy. Mr. McLeod, Financial Commissioner of the Punjab, has asked Captain Powlett, Assistant Commissioner at Goojranwala, who recently visited Jaffer Allee's silk establishment, to furnish him with a report on what he saw, and I dare say the paper will be made public. I have more than once mentioned Captain Powlett's interest in the cultivation of silk, and he has, I now hear, made arrangements for a mulberry plantation at Goojranwala. I propose sending him cuttings from the Umritsur Government Garden."

These cocoons are considered very satisfactory specimens. It was resolved that an application be made to Mr. McLeod, for a copy of Captain Powlett's report.

VEGETABLE GREEN DYE.

The subject that next came under the notice of the Meeting had reference to the specimens of cloth, silk, and flannel dyed with the green vegetable dye alluded to above. Dr. R. F. Thompson, the Civil Surgeon of Malda, who submits these specimens, writes as follows, in a letter dated 22nd May:—

"One maund of the dried leaves will dye 1,280 yards of cloth of a fine apple green color. The supply cheap and unlimited; cultivation easily extended from cuttings or seed. Requires little care or watching as no animal will eat it.

"The plant is doubly valuable, from the seeds yielding a fine clear limpid oil for burning purposes, sample of which I also forward.

"I feel confident you will all pronounce the colour of the green dye beautiful, and the discovery a most important one.

"It takes half an hour to dye a whole "than" of cloth."

In a subsequent communication of the 7th June, Dr. Thompson says:—

"Thanking you much for your letter of the 26th May, I have the pleasure now to advise you of the despatch of the oil adverted to in my last, to your address; it is obtained from the seeds of the plant yielding the green dye, and expressed in the ordinary bazaar fashion, in the common "koloo." You will see what a beautiful colour it has, limpid, and burns well."

In a letter to the address of Dr. Mouat, Dr. Thompson adds a few more particulars on the subject:—

"I have now much pleasure in forwarding for your inspection and identification a branch of the *Jatropha*, closely allied with *J. Curcas* with a brownish leaf; the native name is "Walietie Bag Barendse." The shrub itself forms a most beautiful ever-green hedge, *very hardy*, grows luxuriantly almost any where, independent of climate; requires no watching, cattle will not eat it, and the cultivation may be largely extended from cuttings and seed. The oil submitted for inspection, which is quite limpid, was excellent: burns well, was expressed in the usual native fashion in the common "koloo." I shall let you know in my next what quantity of oil a maund of seeds yield. The seeds should be collected by the *mallee*, as the capsule begins to slightly split, or change colour from a green to a brown; it then should be thrown down on a mat and covered over with another mat or chadder, and in a few hours' exposure to a bright sun, the seeds will have separated from the shell, for if allowed to remain on the shrub till quite ripe, the capsule bursts with a jerk and the seeds are shed and lost."

The Secretary mentioned that duplicate specimens of this dyed cloth, which was much admired, had been sent to the great International Exhibition. The specimen of oil is beautifully clear and limpid.

HILL POPPY.

Read a memorandum from Mr. W. Peppe, on the result of his sowings of the Hill Poppy seed received last year from the Society, being a portion of the supply contributed in July 1861, by Lieutenant J. F. Pogson, (Journal, Vol. XII., page 46.)

Read also extract of a letter from Mr. C. Armstrong, of Ghazeepore, to Mr. Grote's address on the same subject. (See body of the Journal).



Read a letter from Mr. R. J. Bingham, of Chynepore, Sasseram, dated 2nd May, on the subject of madder, cotton, &c., of which the following are extracts:—

"I am glad to say that some of the South African seed sent by Captain Lowther have germinated. The maize is coming on splendidly, and the flower seeds have all germinated, but they come on very slowly. All the other forest seeds, the Kaffir corn, &c., I have kept, and shall have them over on my table lands when the rains set in, and hope they will all come up. I shall watch

the wax-yielding plant with great interest. I have succeeded in getting three Pestachio nuts from Cabul seed to germinate. I wonder whether they will come to anything in this country. My madder plant is seeding again, and is covered with seed in fact, but it is all carried away by bird, beast, or reptile, against which I cannot guard, before it ripens. I sent some of the root home to Manchester, and it was tested by a dyer who uses a great deal of it. He pronounces it to be of *equal value with good Bombay, or worth from 30 to 35 shillings per cwt.* I imagine he means in the root as I sent it, in which case its cultivation should pay where land is plentiful. I was not aware that madder grew in Bombay; did you know that it was an article of export from thence? I should be glad to get more of the seed, as I am by no means confident of rearing any from my plants, if it is carried away before ripening as I have always found it. Will the root bear dividing and transplanting, and if so when should it be done?

“My Nankin cotton—a small bale of which I sent to Manchester—was pronounced by a spinner to be worth 10d. a lb. at present, and he offered to take 100 bags at that price. What a pity—nay, what a shame—that Assistant of mine ruined my crop, or from 25 beegahs of Nankin cotton I could have sent him 10 or 15 bales this year, and had seed for a large quantity of land this season; as it is, I shall have to commence *de novo*, and shall find it hard to procure seed for a beegah.”

Read a letter from Colonel W. H. Norman, Secretary Government of India, Military Department, and submitted its enclosure, namely, a sketch of the Flora of the country passed through by the Force employed under Brigadier-General Chamberlain, C. B., in the Mahsood Wuzceeree country, in April and May 1860, drawn up by Assistant Surgeon J. L. Stewart, M. D.

(Transferred to the Committee of Papers.)

Submitted a letter from Messrs. D. Landreth and Son, Philadelphia, advising despatch, per *Stephen Glover*, of the Society's consignment of vegetable seeds.

Mr. W. G. Rose gave the following notice of motion for the next meeting:—

For alteration of Section 1 of Chapter XI. of the Bye Laws, *viz.* the words “5 P. M.” for “4½ P. M.”

(Wednesday, the 9th July 1862.)

A. Grote, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed, and the following gentlemen elected members :—

Captain A. K. Comber, Captain W. Elwyn, Captain the Hon. A. Stewart, Mr. C. S. Rundle, the Secretary Station Garden Committee, and Nawab Nazeer Ally Khan Bahadoor.

The names of the following gentlemen were submitted as candidates for election :—

John Lemarchand, Esq., Lahore,—proposed by the Hon. D. Cowie, seconded by the Secretary.

C. W. Mackenzie, Esq., Salt Department, Cuttack,—proposed by Mr. A. Grote, seconded by Mr. C. B. Stewart.

J. W. Armstrong, Esq., Superintending Engineer, Cuttack,—proposed by Mr. Grote, seconded by Mr. Stewart.

J. H. Morris, Esq., C. S., Allahabad,—proposed by Dr. J. F. Beatson, seconded by the Secretary.

Captain J. DeC. Sinclair, Bombay Artillery, Secunderabad,—proposed by the Secretary, seconded by Mr. W. G. Rose.

C. J. Hampton, Esq., C. E., Rampore Haut,—proposed by Mr. W. Anderson, seconded by Mr. C. B. Stewart.

C. T. Paske, Esq., Civil Assistant Surgeon, Saharunpore,—proposed by Mr. R. B. Mackay, seconded by the Secretary.

George W. Boothby, Esq., Agent and Manager, E. I. Irrigation and Canal Company, Cuttack,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Rees Davies, Esq., Nyneetal,—proposed by Mr. F. Reed, seconded by Mr. Rose.

Major Charles Robarts, Commandant 17th Bengal Cavalry, Segowlee,—proposed by the Secretary, seconded by Mr. Grote.

C. R. Lindsay, Esq., C. S., Futteeghur,—proposed by the Rev. Malcom S. Laing, seconded by the Secretary.

F. R. Minchin, Esq., Aska (Ganjam),—proposed by Mr. T. J. Knox, seconded by the Secretary.

W. D. Latimer, Esq., C. E.,—proposed by Mr. H. Leonard, seconded by Mr. J. F. Galiffe.

A. Deveria, Esq., Jalinga, Cachar,—proposed by Mr. C. B. Stewart, seconded by the Secretary.

A. N. Stewart, Esq., Collector of Tolls, Jungypore,—proposed by Mr. C. B. Stewart, seconded by Mr. Grote.

The following contributions were announced :—

1.—Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. XIX., Part 3. Presented by the Society.

2.—Report of the Committee of the Bengal Chamber of Commerce, November 1861 to April 1862. Presented by the Chamber.

3.—Annals of Indian Administration, Vol. VI., Part 2. Presented by the Government of Bengal.

4.—A few (10) seedlings of *Amherstia nobilis*, from Moulmein. Presented by G. Buchanan, Esq.

Half of these seedlings have reached in fair condition, and the rest in a sickly state.

5.—Two cases of Orchids, from Arracan. Presented by A. L. McMillan, Esq.

6.—A large quantity of Orchids, from Port Blair. Presented by Major J. C. Haughton.

7.—A sample of flax straw, raised at Debroghur, from Riga seed received from the Society. Presented by G. W. Wagentrieber, Esq.

This straw is of fair length, but too thick and branchy for good fibre; this has been apparently caused by sowing too far apart.

8.—Two small skeins of raw mulberry silk from a cross-breed—Cashmere and Bengali. Presented by C. Moyne, Esq.

The following is extract of a letter from Mr. Moyne, respecting this fine silk :—

“ Herein I have the pleasure to enclose two small skeins weighing each thirteen French deniers, and produced from cocoons of the cross-breed between Cashmere and Bengali monthly silk-worms, of which I have sent you a sample. This silk has been valued in Lyons at ten francs above the best Bengal silk. One of the principal points to attend to, is to rear these worms before the commencement of the east winds, for they invariably cause the death of the worms. Therefore, the best plan is to have the eggs hatched by artificial means, about the 15th of December.”

9.—A sample of cotton raised by Mr. Sarson, at Chittagong, from exotic seed; also a sample of indigenous cotton. Presented by J. D. Ward, Esq.

The motion of which notice was given at the last meeting, for alteration of Section 1 of Ch. XI. of the Bye Laws, by the substitution of the words “ 5 P. M.,” for “ 4½ P. M.” was brought forward and agreed to.

The Secretary desired to correct an error in the report of last month's proceedings, in reference to the oil submitted by Mr. R. F. Thompson, Civil Surgeon, Malda, in which it is remarked that “ it is well known to, and used by, the natives, for various purposes.” This remark was made under the

impression that the oil was obtained from the seed of *Jatropha curcas*, whereas Mr. Thompson states it is obtained from another species of *Jatropha*, which is not indigenous to the district, and the oil quite unknown to the people.

COTTON.

Read a letter from J. D. Ward, Esq., Collector of Chittagong, in reference to the samples of cotton above referred to.

SILK CULTIVATION AT UMRITSUR.

Read a letter from D. F. McLeod, Esq., Financial Commissioner of the Punjab, submitting, in compliance with a requisition made to him at the last monthly meeting, a copy of recent correspondence respecting silk cultivation at Umritsur.

Letters were likewise read from R. J. Bingham, Esq., of Chynepore, dated 17th June, submitting a report on the productive resources of the Sasseram District, (referred to the Committee of Papers); and from Messrs. James Carter and Co., advising the despatch of field-crop seeds and of peas and beans, per *Undaunted*, via the Cape, and of other vegetable seeds, by the first Overland steamer of June.

(Wednesday, the 13th August 1862.)

Baboo Peary Chaud Mitter, senior member present, in the Chair.

The proceedings of the last meeting were read and confirmed, and the following gentlemen elected members : —

Mr. John Lemarchand, Esq., Mr. C. W. Mackenzie, Mr. J. W. Armstrong, Mr. J. H. Morris, Captain J. DeC. Sinclair, Mr. C. J. Hampton, Dr. C. T. Puske, Mr. G. W. Boothby, Mr. Rees Davies, Major C. Roberts, Mr. C. R. Lindsay, Mr. F. R. Minchin, Mr. W. D. Latimer, Mr. A. Doveria, and Mr. A. N. Stewart.

The names of the following gentlemen were submitted as candidates for election :—

F. J. Alexander, Esq., C. S., Monghyr,—proposed by the Honorary Secretary of the Monghyr Public Gardens, seconded by the Acting Secretary.

The President of the Mess Committee of H. M.'s 23rd Regiment, or R. W. Fusileers, Fyzabad,—proposed by D. Simson, Esq., seconded by the Acting Secretary.

R. S. Brundell, Esq., Resident Engineer, East India Railway, Chunar,—proposed by Captain Geo. Weld, seconded by the Acting Secretary.

J. McCall, Esq., Merchant, Moulmein,—proposed by Mr. John McGavin, seconded by the Acting Secretary.

T. G. Atkinson, Esq., Secretary Beerbhoom Coal Company, Calcutta,—proposed by the Acting Secretary, seconded by H. Reinhold, Esq.

Herbert Bainbridge, Esq., Tea Planter, Assam,—proposed by the President, seconded by Mr. W. S. Seton-Karr.

Brigadier W. O. G. Haly, C. B., Commanding Peshawur District,—proposed by the Acting Secretary, seconded by Baboo Peary Chaund Mitter.

Captain H. B. Impey, Deputy Commissioner, Sumbhulpore,—proposed by Mr. H. V. Bayley, seconded by Baboo Peary Chaund Mitter.

W. R. Larninie, Esq., C. S., Serampore,—proposed by Mr. H. E. Braddon, seconded by Mr. R. Blechynden.

G. W. Vivian, Esq., Civil Engineer, Moorshedabad,—proposed by Mr. H. E. Braddon, seconded by Mr. R. Blechynden.

L. W. Toulmin, Esq., Merchant, Ballygunge,—proposed by Mr. G. Dearman, seconded by Mr. H. Murdoch.

Apurvu Krishna Bahadoor, of Soba Bazar, Calcutta, - proposed by Baboo Peary Chaund Mitter, seconded by Baboo Sibchunder Deb.

H. H. Brownlow, Esq., Tea Planter, Coocheela, Cachar,—proposed by Mr. H. Reinhold, seconded by the Acting Secretary.

Max Vonfigger, Esq., Tea Planter, Kollacherra, Cachar,—proposed by Mr. H. Reinhold, seconded by the Acting Secretary.

The following contributions were announced :—

1.—Journal of the Madras Literary Society for December 1861. Presented by the Society.

2.—Three samples of Cotton grown in Washington Estate, Province Wellesley. Presented by C. Maddox, Esq. (Referred to the Cotton Committee.)

3.—A sample of Red Clover grown at Debroghur from seed received from the Society. Presented by G. W. Wagentrieber, Esq.

4.—Samples of Cotton and Seed from New Orleans, Egyptian, and native stock, and of the soil in which the former were grown. Also a packet of double Ziunia seed, all from Lucknow. Presented by Dr. Bonavia. (The Cotton samples, seeds, and soil were referred to the Cotton Committee.)

5.—A small sample of Zambesi Cotton, with seed, forwarded through Dr. Anderson, from Dr. Livingston's African exploring party. Presented by the President. This is a black seeded variety, and the seeds have been forwarded to the Society's garden for immediate sowing.

6.—A packet of fresh Imphee seed grown at Cuttack. Presented by Major Triscott.

7.—A branch and seeds of the so-called Bullet Wood Tree from Port Blair. Presented by Major Houghton. From the appearance of the seeds there can be no doubt that this tree belongs to the order *Simulaceae*.

8.—Seeds of a large tree, name unknown, from Port Blair. Presented by Edward Blythe, Esq.

9.—Produce of two plants of New Orleans cotton and seed grown in his

garden in Calcutta. Presented by the Secretary. This is an excellent cotton, and on being separated from the seed and weighed, the result is found to be 10 tolahs of cotton and 20 tolahs of seed.

10.—Two cases of Orchids, from Moulmein. Presented by Colonel Fytche.

A recommendation from the Council was submitted, in accordance with a memorandum received from the President, suggesting that the Society would move the Supreme Government in favour of establishing a Museum of Economic Botany in Calcutta. The Meeting adopted the recommendation, and directed the Secretary to address the Government as suggested in the President's memorandum.

COTTON.

* The following letter from Mr. C. Maddox accompanying the samples before mentioned from Province Wellesley, dated 31st March last, was then read:—

"Accompanying this is an essay on the culture of cotton in the East Indies grown from foreign seed, and three small musters of cotton sent to shew the quality, &c., of the cotton grown here. The quantity of each sent is small, as they had to be forwarded by post; but I trust they will be large enough to shew the different sorts of cottons raised. My attention was only recently called to the offer made by the Association, and I was solicited to supply an account of this plantation, as it would be in strict conformity with the rules laid down for competition. I have only been able during the intervals between my attention to the plantation, to give any to this subject, which will account for the hurried manner of its compilation. Since writing the essay, it has been determined upon, that 5,000 orlongs of land, equal to nearly 7,000 acres, should be obtained for cotton culture. This having been agreed upon by the two gentlemen associated with me, (both Americans, one from the State of Georgia where he was a planter, and now has an estate there) steps have been taken to secure it, and after an inspection of different sites, application has been made to Government for it, and granted by them on very favorable terms. The establishment of this plantation has caused several of the other planters to turn their attention to growing cotton, one of whom has upwards of 40 acres under cultivation, and I do not doubt that the "Straits Settlements" will before long be able to supply a considerable quantity of this important article, from the fact of so many persons having been stimulated into producing it, from the success attending the planting of this undertaking."

This letter was accompanied by a notification from the Council, that as the essay referred to had arrived in Calcutta before the date fixed for Prize Essays to be received, viz. 1st May, and was accidentally detained in the Custom House, it had been admitted to compete with the other essays that had been received for the prize offered by the Society.

Read the following letters :—

1st.—From Lieut. F. Pogson, Simla, regarding the culture of Hill Poppy.

2nd.—From A. C. Campbell, Esq., Burpettah, Assam, forwarding a few notes on Tea cultivation in Assam. (Referred to the Committee of Papers.)

3rd.—From Messrs. D. Landreth and Sons, Philadelphia, forwarding invoice of vegetable and field-crop seeds per ship "Stephen Glover." With regard to the supply of American cotton seed, they remark as follows:—"The atrocious insurrection which has sprung up in the cotton states, has prevented our obtaining the usual supply of cotton seed, and hence the present shipment does not include any; but a supply is daily expected, and will go forward either via Boston or Liverpool."

(Wednesday, the 10th September 1862.)

A Grote, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed, and the following gentlemen were elected members :—

F. J. Alexander, Esq., the President of the Mess Committee of H. M.'s 23rd Regiment or R. W. Fusileers, R. S. Brundell, Esq., J. McCall, Esq., T. G. Atkinson, Esq., Herbert Bainbridge, Esq., Brigadier W. O. G. Italy, Captain H. B. Impey, W. R. Larmine, Esq., G. W. Vivian, Esq., L. W. Toulmin, Esq., Rajah Apurvu Krishna Bahadoor, H. H. Brownlow, Esq., and Max Vonfugger, Esq.

The names of the following gentlemen were submitted as candidates for election :—

D. J. Morgan, Esq., Manager Soroispor Tea Company, Chundypore, Cachar,—proposed by Mr. H. Reinhold, seconded by Mr. W. Haworth.

W. F. Graham, Esq., Indigo Planter, Colgong,—proposed by Mr. W. Landale, seconded by Mr. Gregor Grant.

George Buchanan, Esq., Merchant, Moulmein,—proposed by Colonel A. Fytche, seconded by Mr. A. Grote.

Lieut. J. Forsyth, Officiating Superintendent of Forests, Central Provinces,—proposed by Captain S. Ryder, seconded by Mr. C. A. Cantor.

Charles Brownlow, Esq., Manager Kunchanpoor Tea Company, Cachar,—proposed by Mr. H. Reinhold, seconded by the Acting Secretary.

William Gordon Young, Esq., C. S., Chittagong,—proposed by Mr. J. D. Ward, seconded by Mr. J. G. Balfour.

Major A. H. E. Hutchinson, Political Agent, Sehore,—proposed by Mr. A. Grote, seconded by Mr. S. Douglas.

Surgeon Major R. Whithall, 25th Brigade Royal Artillery, Dehra Doon,—proposed by the Acting Secretary, seconded by Mr. W. G. Rose.

Lieut. J. Burnell, Executive Commissariat Officer, Hazareebaung,—proposed by Mr. J. Jenkinson, seconded by Mr. W. Haworth.

The following contributions were announced :—

1.—Journal of the Asiatic Society of Bengal, No. II. of 1862. Presented by the Society.

2.—A Lecture on the Silk-worm, delivered by Mr. H. Cope, at Anarkully, in July 1862. Presented by the author.

3.—Sample of cotton grown from seed received from the Society, in the vicinity of Nissindpore, Jessore. Presented by P. Durand, Esq. (Referred to the Cotton Committee.)

4.—Two packets of seeds of the *Ramkota* and *Mohal*, two jungle trees of Cachar. Presented by C. Brownlow, Esq.

Mr. Brownlow describes them as follows :—

“ 1. The acorns of the *Ramkota* reported to be very durable and excellent timber, and much used by the natives for purposes where durability is required.

“ 2. The seeds of the *Mohal*, a resinous tree from which a balsam exudes resembling in odour capivi. When this tree flowers, *i. e.* in April and May, the whole jungle is filled with its fragrance. It is one of the commonest jungle trees here, is of rapid growth, and would, I think, answer well as a roadside and ornamental tree in Calcutta grounds and public places.”

The acorns of the *Ramkota* were referred to Mr. T. Teil, proprietor of Kidderpore Tannery, with a request that he would report on their value as a tanning material.

5.—A sample of Fibre from a plant growing wild in great abundance at Malda. Presented by Dr. R. F. Thomson. (To be referred to the Cotton Committee, after further enquiry from Dr. Thomson as to the appearance and nature of the plant.)

6.—Two small samples of cotton grown from exotic seed at Muddundary, Jessore. Presented by R. C. Bell, Esq.

COTTON PRIZE ESSAYS.

A recommendation from the Council was submitted, founded on the Report of the Committee appointed to award the prize of Rs. 1000 and the gold medal of the Manchester Cotton Supply Association, for “ the best essay on the cultivation of cotton in India from foreign seed.” The Council confirm the award of the prize to Dr. Shortt of Chingleput, and recommend the publication, in the Society’s Journal, of the essays submitted by “ Alexander,” Mr. Maddox of Province Wellesley, and Mr. P. Saunders, as eminently practical papers, provided their respective authors agree to such publication. The above recommendation of the Council was adopted.

A further recommendation from the Council was submitted for the bestowal of a sum of Rs. 250 on Mr. W. Bennett, of Ellengunge, as a special case, for an essay on cotton cultivation in the Sunderbuns placed at the disposal of the Society for publication in their Journal, and recommended by the Committee of Papers as deserving of especial acknowledgment. The above recommendation was adopted, and ordered to be submitted to the next Monthly Meeting for confirmation.

The following communications were then submitted :—

1.—From A. M. Montearth, Esquire, Under-Secretary to the Government of India, in reply to the Secretary's letter suggesting the establishment of a Museum of Economic Botany, as directed at last Monthly Meeting. The reply is as follows :—

"I am directed to acknowledge the receipt of your letter dated the 20th instant, on the subject of the establishment of a Department of Economic Botany in the proposed Imperial Museum, and in reply to inform you that it will be considered when the question of the proposed Museum again comes before the Governor General in Council."

2.—From Colonel Tytler, Superintendent of Port Blair, applying for seeds and fruit-tree grafts, and offering to supply in return any plants that the Society may desire to obtain from that settlement. Ordered, that Col. Tytler's wishes be met as far as practicable, and that he be requested to return any good orchids in exchange.

3.—A letter from the Government of India, forwarding the following Note on the cultivation of *Chinchona*, by Mr. Spruce.

"Mr. Markham's notions on the cultivation of *Chinchona* entirely coincide with my own. If some empiric, who has never seen the *Chinchona* in their native country, has sufficient influence to induce the Indian Government to attempt to cultivate *Chinchona* plants according to some method distinct from the one proposed by those who have had that advantage, by all means let him be made responsible for the result.

"The plan pursued by the Dutch of growing the *Chinchonas*, in the shade of dense forest, has always seemed to me most erroneous, and the person who devised it has read the lesson afforded by a study of the conditions of their existence on their native soil quite differently from what I have done. One of the first things that struck me in the great Amazonian forest was the struggle for existence maintained among the individual plants which compose it. Not only (as among animals) are the more robust species and individuals continually harassing and displacing the weaker ones, but a parent tree (so far from cherishing) actually smothers thousands of its offspring beneath its own shade. Every place seems occupied, and of the seedlings which spring

~~the shade of the forest trees and even in the full sun it would not be expected to arrive at maturity, so that the land beyond the plantation, except an outlet be made for it by the decay and fall of its parent or of some neighbouring giants of the forest. But let the same seedlings be planted in recently cleared ground, and nearly every one will prosper. I have seen the experiment tried, and the only indispensable precaution is that it be done in the rainy season, when neither natural nor artificial shade is needed, but would on the contrary be positively prejudicial.~~

"There are tribes of plants, always of humble growth and usually of obscure appearance, which naturally seek the shade. The sub-order *Coffeaceæ* (of the great order *Rubiaceæ*) has many examples of this propensity, and the coffee-tree itself is one of the most notable. In South American forests, the numerous species of *Psychotria* and other genera allied to *Coffea* are all shade-loving plants; but even these, granted their normal conditions of temperature and humidity, grow perfectly well in the full glare of sunshine; and I suspect they seek the shade because they find there a sufficient and unvarying humidity, rather than to avoid the light. The sub-order *Chinchoneæ*, and especially the species of *Chinchona* itself, mostly seek to rise into the full influence of the light, before they display their gaily-coloured flowers, whose development is essential to the permanence of the species. The official *Chinchonæ* are nearly all forest trees; and those which are not have for companions bushes as humble as themselves.

"My own opinion is that, if the same climate can be found in India as the Red Bark tree possesses in its native country, no shade at all will be required after the plants are once well rooted. The fogs which prevail in the woods of Chimborazo are an all-sufficient shade, and it is only during four months in the year (June, July, August, and September) that the trees are exposed to (I would rather say enjoy) about six hours' sun per day. I believe, if you consult Mr. Cross, you will find his opinion coincide with mine, as to the expediency of allowing to the *Chinchona* plants the full influence of the light and air, provided that the necessary misty atmosphere and the freedom from violent winds can be secured.

"As Mr. Howard has found slender quilk-bark of *Cb. succirubra* so productive in alkaloids, Mr. McIvor's plan of growing the *Chinchonæ* as bushes or low trees, and of reaping an annual crop of bark from their lopped branches (similarly to what is practised with the Cinnamon), is well worth trial. *Chinchona* trees are only sparsely branched, but they are very patient of mutilation, and speedily put forth pairs of branchlets for every branch that has been lopped, if only one or two leaf-nodes have been left on. So much pruning might, perhaps, cause the trees to flower and fruit more than is desirable, but that can only be determined by experiment. Even if the trees

were cut down, once for all, when arrived at maturity, I cannot but think that their cultivation (on an extensive scale) would be eventually remunerative. The man who plants a wood of oaks or elms cannot hope to live to cut down the trees for timber, but every year his plantation increases in value, and is so much capital at accumulative interest, and the same would be the case with a plantation of Chinchonas. In whatever way the question of pecuniary profit or loss may be decided, it is clear that, if we will have quinine, we must plant Chinchonas. In the forests where, a few years ago, Mr. Karsten speculated that the Chinchona trees would never be exhausted, I am informed that, at this moment, people are digging up old roots, the scanty supply of bark thus obtained being all that is now to be had there."

4.—From Mr. W. Haworth, forwarding the following Memorandum on packing tea seed for conveyance to distant places.

"The seed, when quite ripe, should be taken from the capsules as soon after it is removed from the trees as convenient, and it should then be dried in the sun for an hour or two; strong iron clamped tea boxes are the best package, and the seed should be put in along with *dry* pounded or coarse dust wood charcoal, as follows:—A layer of charcoal of about half an inch in thickness to be spread over the bottom of the box, then a layer of seed laid close together, and another layer of charcoal just enough to hide the seed, and so on, until the box is quite full, care being taken to press down the mass with the hands on the completion of every third or fourth layer, and at the same time spread over the surface a sheet of old newspaper, or country paper, thin matting, or old wrapper, and repeat this at every third or fourth inch in height: the paper to be cut somewhat larger than the box, the object of this is to prevent the seed from working up, and the charcoal from descending by constant shaking in transit, and which will be the case if some precaution of this kind is not adopted.

"Ripe tea seed, cotton seed, and many other kinds of seed, so packed, will remain in good condition, and vegetate well after a long lapse of time, and they are not affected by great changes of temperature, or by the packages getting wet when so treated. The boxes should be lashed with strong rope as it prevents their being piled too close together, and provides for a circulation of air amongst them."

Mr. Haworth, in his note accompanying the above, remarks that all the seed he has packed as above recommended, has succeeded well; whilst that packed at the same time in bags only, he has never found to give more than 20 to 30 per cent. of plants.

5.—From Captain F. H. Cobbe, Secretary to the Agri-Horticultural Society of the Central Provinces, Nagpore, applying for Rs. 300 worth of American and European vegetable and flower seeds. Ordered, that the

application be met as far as practicable, and that the seeds be charged at cost price.

6.—From T. Brine, Esquire, of Hope Town, Darjeeling, intimating his hope of establishing a Branch Society there, and asking the advice and assistance of this Society. Ordered, that the same privileges be granted to this Society, with respect to supplies of seeds and plants, as were afforded to the Balasore Branch Society.

7.—From Dr. T. Dillon, Political Agent of Munnipore, who writes as follows :—

“This country produces large quantities of the perennial cotton, which, of course, for the European market is not of much value; but it seems to me longer in the staple than other specimens grown by hill tribes on this frontier.

“During the greater part of the year rain falls here, but not to any excessive degree at any particular time; the soil always retains some moisture, which, I believe, is so necessary to produce a superior staple, and owing to the quantities of lakes here, irrigation could be cheaply and easily established if necessary.

“The soil of the mountains, the hills, and the valleys is the finest I have seen in India: it is of a strong black loamy superstratum with a red clayey substratum. Kookie and Nagur labour is abundant at Rs. 2 per mensem—one rupee being sufficient to support a coolie in the month.

“I fancy cotton could be grown here with great profit to the cultivator. I am most anxious to develop some product which will rouse some sort of commercial industry here, and advance civilization, which is very low indeed. I should feel exceedingly obliged if you would ascertain for me, if possible, if—considering the above cost of labour—the cultivation of cotton would give a fair profit to the producer—say, costing carriage to Cachar one rupee per maund, and from Cachar to Calcutta, I fancy, per native boat, about eight annas per maund.

“I could easily induce a very large and very tractable hill population to adopted by degrees the proper mode of cultivating it. It would eventually be an effective mode of bringing thousands of those people within the range of civilization, which, if once done, would add considerably to the labourers so required in Cachar and Sylhet. Where can I get 1st class American seed?”

Resolved, that Dr. Dillon be asked to send down samples of the native cotton for examination, and that he be supplied with any cotton seed that the Society may have available.

8.—From Mr. F. W. Tabernacle, Principal of the Lawrence Asylum, Murree, applying for some seeds for the use of the boys, who are taught

gardening both in principle and practice. Resolved, that a parcel of each kind of vegetable seeds be supplied to the Asylum free of cost.

9.—From the Society's Head Gardener, Mr. Errington, suggesting that the services of Mr. Hayes, his assistant, be dispensed with, as no longer required. Ordered, that Mr. Hayes be discharged from the end of the current month.

10.—From Mr. F. Muller, Melbourne, acknowledging receipt of a case of plants from the Society, and stating that he had recently introduced a quantity of *Araucaria* seedlings from New Caledonia, and his intention of forwarding a case of them to the Society next year.

11.—A Report from Baboo Peary Chand Mitter on the Sylhet rice or "Joom Dhan," submitted to the Society at their Meeting of 19th July last, as follows :—

"This rice, which looks somewhat like the Burmah rice, is not viewed with favour here even by the lower orders of the people, who prefer cheap and coarse kinds of Bullam. In the Calcutta market its consumption is therefore likely to be limited. It may be valued at Rs. 1-2 to 1-4 per bazaar maund. The rice has been somewhat spoilt, and it is therefore unnecessary to boil and judge it by the taste."

12.—From Messrs. D. Landreth and Sons, Philadelphia, advising despatch, via Liverpool, of 250 lbs. Sea Island, 250 lbs. and 5 bushels of Upland Cotton seed for the Society.

AN ESSAY
ON COTTON CULTIVATION IN INDIA
FROM FOREIGN SEED.

BY DR. J. SHORTT
ZILLAH SURGEON CHINGLEPUTT.

*From the Journal of the Agricultural and Horticultural Society of India
Vol. X. Part. IV.)*

INTRODUCTION.

IN submitting this Essay, I beg to state that the opinions advanced here, are the results of my own personal experience, or of actual observation.

In giving the botanical description of the cotton plant, although I consulted "Balfour's Botany," "Balfour's Cyclopaedia," "Doctor Royle's book on cotton," and "Orr's circle of the sciences," Vol. II Organic nature, nothing was inserted, but what I fully satisfied myself to exist on comparison with the living plants; which I have now growing in my garden. On the cultivation of the plant, Dr. Shortt's "Essay on Indigo" and "Agricultural Chemistry" by Davy, were freely consulted.

In the description of insects, I have followed the classification given by Dallus in Orr's circle of the sciences, Vol. II. Organic nature, "Carpenter's Zoology," "Kirby and

Spence's *Entomology*," Milne Edward's "*Manual of Zoology*," and Baird's "*Cyclopædia of the natural sciences*," were also consulted.

Every one of the insects described were taken either in their larvæ, or in their mature state from the plants, their habits closely watched, and in the instances of the larvæ they were reared till they passed through the various changes of pupa, and imago. Having doubts as to the specific names I have not attempted to make any practical application of them as I have retained in my possession duplicates of the specimens and forwarded others to a scientific gentleman attached to the British Museum for identification. I hope shortly to be in possession of the specific names also. On the subject of Chemistry, Dr. Thompson's "*Organic Chemistry*" and Pereira's "*Materia Medica*" were consulted.

I forwarded samples of cotton to the Manchester Cotton Association through their honorary agents, for the purpose of ascertaining its quality, staple, and commercial value, and was in hopes of being able to embody the information in this paper, but although the samples were forwarded as early as May 1861, as yet I have received no reply. On applying to the agents, the following extract of a letter from the Secretary of the Manchester Cotton Association dated 8th January 1862 was given :

"I have received your favour of the 13th November, enclosing Bill of lading of a bag of cotton from———The wishes of that gentleman shall be promptly complied with; when the cotton comes to hand." But on again drawing the attention of the Honorary agents to the fact of having forwarded to them samples of one pound each of several varieties of Cotton for transmission to the Manchester Cotton Supply Association in May 1861, the following reply was received.

"Madras 3rd April 1862,

"In reply to your letter regarding the cotton samples forwarded by you through us to the Manchester Cotton

Supply Association, we regret to say that though they were sent by us by the Steamer of the 11th June last, we have not yet been favoured with a report on their quality. "In our next letter to the Secretary of the Cotton Supply Association we shall not fail to call their attention to this omission."

My experimental plantation was visited by the Honorable Mr. Morehead, in December 1861, Dr. Hunter, Superintendent of school of Arts, February 1862, by Mr. Brown, Superintendent of the Horticultural Gardens Madras, in March 1862.

A Committee of scientific and commercial gentlemen at Madras, pronounced the following opinion on the various specimens submitted by me for their report.

"Brazil cotton grown in both, garden and field culture, was long in the staple, very clean, and good in colour, the estimated value 10 pence to 11d. per pound. The pods from garden culture are very fine.

"The New Orleans cotton was silky, of very fair staple, but not so good in colour as the former, value 10d. per lb.

"The Bourbon cotton of garden culture, not so good as the New Orleans, but of fair ordinary quality—One variety of the field culture of Bourbon cotton very fine.

"Country Cotton of very fair quality well coloured and perfectly clean. Like good Western cotton."

These cottons were submitted in quantities varying from 5 to 14 lbs.—I have now by me upwards of 100 lbs. of Exotic cotton wool which I purpose sending to the Manchester Cotton Association in May next. Should this Essay meet with favour in the hands of the adjudicators, I hope to be able to obtain in another month or two, further valuable information bearing on this subject, which I should be glad to make available. At the last moment I received a clit from Professor Mayer in which he states that, "unforeseen and unpleasant matters have put it out of my power to do any thing for you in the way of analysis. * * * * *

As soon as I am more at leisure I will turn my attention to these ashes."

Drawing from the living plants is being executed for me by Dr. Hunter at the school of Arts. Should this Essay meet with favour I hope to be in a position to furnish the analysis of the ash, and drawing of the plants.

9th April, 1862.

Essay on Cotton Cultivation in India from Foreign seed.

"Experience is the mother of Science."

COTTON.

The consideration of this subject may be conveniently divided into the following parts.

- I. A brief History of Cotton.
- II. The Cotton yielding plants.
 - A. Indigenous species.
 - B. Exotic species.
- III. Cultivation of the plant.
- IV. A description of the Diseases, Insects, and other injurious influences which are destructive to the Cotton plant.
- V. Experiments with
 - A. Indigenous species.
 - B. Foreign species.
 - C. Observations on both.
- VI. The collection and preservation of the cotton wool &c.

It may not be out of place to consider each of these subjects separately as we proceed.

I. HISTORY OF COTTON.

When man first became aware of his nudity after the Fall, he resorted to leaves to form his first clothing. Subsequent-

ly he clothed himself in skins of beasts, but in course of time he learnt to weave their wool or hair into garments; eventually he substituted for these the fibres of certain plants as hemp and flax; and lastly cotton woven into cloth. Cotton was indigenous to India, and the art of spinning and weaving appears to have been known to the natives from the earliest times. Herodotus mentions it in his description of India and speaks of the wool as growing on trees like fruit, more beautiful and valuable than that produced from sheep, and like it, used for clothing. It is first mentioned as an article of commerce in the second century by a Merchant named Arrian, who states that Arab Traders brought it to Aduli, a port of the Red sea, and to Barygaza, now called Broach, which is still a mart for cotton. In the 9th century, cotton was not in general use in China, from whence it is supposed that it was originally introduced to India, and established there. From India, it passed to Persia, Arabia, Egypt and from thence to Western Africa and extended to Syria, Asia Minor, the Levant, and parts of southern Europe, where it was carried by the Moors, who cultivated it in Spain in the 11th century. It was also cultivated in the Levant. But the growth of cotton was not confined to the old world, for Columbus found it in the west Indian Islands,—Magellaens in Brazil. Cortez received presents of cotton cloth in Mexico, and it was found in the ancient Peruvian Tombs both in its raw and manufactured state. It has also been found in many Islands in the Indian Ocean, and of the coast of China, extending as far as Japan, and has been cultivated in India, and America, in times so remote, as to be beyond the reach of history. Cotton was first introduced into England from the Levant in 1298, for making candlewicks, and in the 14th century, it was manufactured in Italy. The cotton manufacture is supposed to have been introduced into England from Flanders in 1585, by those Protestant weavers, who fled from the persecution raised by Philip of Spain, and

settled in Manchester, where there was in 1641, a manufacture so well established, that several kinds of cotton Fabrics

McCulloch's statistical account of the British Empire. Vol II. P. 61. were supplied for Foreign use.*

When cotton first began to attract attention in Europe, in the 17th century, like all newly introduced articles of commerce, it met with much opposition, from the belief that it would injure the woollen manufacture. Stringent laws were enacted to prevent its use in Great Britain, which subjected importers to fine, or imprisonment. It even led to riot and bloodshed, and to the use of cotton was attributed, all the ills that flesh is heir to, and "misery and ruin predicted to unborn generations."†

Cotton was first imported from India into England in 1783,

† "This day one Michael Carmoody was executed here for felony upon which the journeymen weavers of this city (who labour under great difficulties by reason of the deadness of trade occasioned by the pernicious practice of wearing cotton) assembled in a body, and dressed the criminal hangman and gallows in cottons in order to discourage the wearing thereof; and at the place of execution the criminal made the following remarkable speech:

"Give ear O good people to the words of a dying sinner. I confess I have been guilty of many crimes that necessity compelled me to commit, which starving condition I was in I am well assured was occasioned by the scarcity of money, that proceeded from the great discouragement of woollen manufactures. Therefore good Christians, consider, that if you go on to suppress your own goods, by wearing such Cottons as I am now clothed in, you will bring your country into misery which will consequently swarm with such unhappy malefactors as your present object is, and the blood of every miserable felon that will hang after this warning from the gallows, will be at your doors.

"And if you have any regard for the prayers of an expiring mortal, I beg you will not buy of the hangman the Cotton garments that now adorn the gallows, because I can't rest quiet in my grave, if I should see the very things wore that brought me to misery, and this untimely end,—all which I pray the gentry to hinder their children and servants for their own character's sake tho' they have no tenderness for their country, because none will hereafter wear Cottons, but Oyster-women, Criminals, Hucksters, and common hangmen."

"Vide-Gentlemen's Monthly Intelligence dated 3rd May 1734."

and when the late Court of Directors gave the subject their attention in 1790, the supply was soon quadrupled. At this time a good deal of cotton was imported from the West Indies, but little or none from the United states, as it was not indigenous to that part of the world, but was introduced there from the Islands, or from Mexico. "A little of the short staple cotton was grown in Virginia about 1640, but it was not until the demand in England increased so largely, that the inhabitants of the States turned their attention to the subject, which they did with such vigour and perseverance, that in the course of a few years, the largest supply of Cotton imported into Europe was from the United states." The first considerable import of Indian Cotton took place in 1788, four year's prior to any import, worth naming, from America. Until about 1813, the Cotton trade was a close monopoly; since then, it has been free, and has consequently largely increased.

No attention was paid to the Culture of Cotton in India till about a century after the establishment of the East India Company. The first importation of Cotton, as stated above, took place in 1783. It was then, that the attention of the Indian Government was drawn to the encouragement of the growth of Cotton; and in 1790, Dr. Anderson of the Madras Army, was employed in distributing Cotton seed, from the Mauritius and Malta, throughout the Peninsula of India. Subsequently plantations were established in different parts, and a small quantity of foreign Cotton was grown in Malabar, and the produce sent to England in 1801. In 1810, West Indian and American Cotton seeds were sent out to India for trial, and in the following year, seeds from Bourbon were distributed. In 1813 Cotton seeds from Persia were sent to India and various experiments tried. In 1840, American Cotton Planters were sent out with seeds and implements, to test the success of foreign Cotton in India. In 1842, Drs. Wight and Brown, were appointed Superintendents of the

experimental Cotton plantations, which had been established at Coimbatour and Broach.* These have since been abandoned;

* Royle's Book on nevertheless, Exotic Cotton continues to Cotton.

be cultivated in many parts of India, with success for the most part, by amateur planters.

There are several groups of plants that yield Cotton, or rather a soft downy substance, which is found attached to the seed. Next to the cereals, these form one of the most important groups of plants; from "The fact of their sustaining
"one sixth of the Population of Great Britain and giving
"comfort to every nation under the sun."

II. THE COTTON YIELDING PLANTS.

The Cotton yielding plants may be classified under three genera; viz :

1st Malvaceæ.

2nd Sterculaceæ.

3d Asclepiadaceæ.

1st Malvaceæ.

Of this genus, there are several varieties; the chief group being that of the genus *Gossypium*, belonging to the natural order Malvaceæ, and which has, from time immemorial, supplied both the Old and New world, with Cotton, or that soft downy substance which envelopes the seed and is so admirably adapted for being woven into cloth. Of the genus *Gossypium*, there are several species indigenous to India and America. Botanists have described as many as twenty four species, under cultivation. The species have been unnecessarily multiplied, owing to the slight shades of difference arising from foreign acclimation, the result of peculiarity of soil and climate. I have here adopted the arrangement given by the late Dr. Forbes Royle, which has been approved by Dr. Cleghorn conservator of Forests in the Madras Presidency. The species have thus been reduced to the four detailed below.

1. *Gossypium Herbaceum*.

2. *Gossypium Arboreum*.
3. *Gossypium Accuminatum*.
4. *Gossypium Barbadosense*.

These may be conveniently divided into Indigenous and Foreign species.

A. Indigenous Species.

1. *Gossypium Herbaceum*, or Indian Cotton. This species is indigenous to Tropical regions, and to the hottest parts of the Temperate Zone; it is in general cultivation all over India and furnishes the chief article of commerce in the Indian Peninsula. To this species, belong many varieties, which have been found in China, Malaya, and Egypt. The Nankin Cotton cultivated chiefly in China, but now grown in various parts of India, belongs also to this species. The plant is herbaceous and is cultivated as an annual; but when allowed to grow, it becomes a perennial; attains from 4 to 8 feet in height, germinating and ripening its seeds in from 4 to 8 months, according to the particular variety to which it belongs; stem erect, having from 10 to 12 short branches. Younger parts of stem, branches, leaves, petioles, and flowers hairy, the base of petiole and upper part tinged; in some varieties, slightly red; petioles long and hispid; leaves generally lobed; lobes broad, rounded, and in some varieties, slightly pointed; sub-lanceolate or acute stipules, hooked; lance shaped. Flowers of bright, yellow colour, with a purple spot near the claw; axillary and solitary towards the extremities of the branches; segments of the exterior calyx or bracts, cordate at the base: margin dentate, sometimes entire. Capsules ovate, pointed, 3 or 4 celled; seeds free, covered with a white down under the wool.

2. *Gossypium Arboreum*.

Or Religious Cotton; sometimes *Gossypium Nigrum*, Stem arborescens; 12 to 15 feet; generally shrubby; young parts hairy,

the whole plant tinged of a red colour; leaves palmated, 5 or 7 lobed; hairy, and dotted with darkish spots of a dark green colour; lobes deeply intersected; elongated, lanceolate, sometimes mucronate; sinus obtuse; glands one to three; stipules oval; flowers solitary, with short peduncle, red, having a yellowish tinge near the claws. Leaflets of the exterior calyx, cordate; ovate; entire; sometimes dentate. Capsules ovate; pointed; 3 or 4 celled, seeds covered with greenish coloured fur, enveloped in fine silky white wool.

This is an ornamental species commonly cultivated in most parts of India, and is generally found growing near Hindu temples; in Fakeer's habitations, and in gardens, on account of its dark-red flowers. It is characterised by a tall, shrubby stem, and by the young plant being tinged with red. It is also found in the Island of Celebes, Arabia and Egypt.

It is not in general cultivation; nor does it appear to have been cultivated on a large scale. The produce of a few plants grown in gardens, or near temples, is consumed by the inhabitants of the locality, and as far as can be ascertained, none seems to have been exported; as it is generally grown in such insignificant quantities. Although the staple of the wool is fine, it is not of much value, as it is deficient in length. There are varieties in this species: the difference consists in slight shades of colour of the plant, its flower, and sometimes of the cotton itself, being generally the result of local peculiarities, dependent on climate and other causes.

B. Foreign Species.

Foreign or exotic Cotton was introduced into India with the view of improving the Country Cotton. Seeds have, from time to time, been imported—and various experiments tried, with fluctuating success. The imported species consisted, chiefly, of *Gossypium Accuminatum* and *Barbadense*. These experiments tended to naturalise the Cotton in different parts of India with some success. But the want of the necessary

stimulus and energy, with a proportionate demand for the article itself, has arrested its further extension.

Unfortunately, the acclimation of Cotton seeds in various countries has led to much confusion with reference to the species; as the original names were soon lost sight of, and the names of localities where the Cotton was last acclimated, were given to the seeds, such as Sea Island, New Orleans, Bourbon, Egyptian, American, &c. This has increased the confusion, and caused great difficulty in recognizing the different species; as, from physical causes, plants raised from the same seed exhibited different shades, and thus produced a number of varieties, which came to be considered as distinct species. Hence arose the large number of species described by some Botanists.

3. *Gossypium Accuminatum* or *Brazil Cotton*.

Perennial, sub-arborens, growing to 10 or 15 feet in height, leaves, the lower entire, the upper sometimes divided, large, generally from 5 to 7 lobed. Lobes oblong, tapering, very acute; sometimes broad; and dentate at apex; bracts or exterior calyx large, dotted externally, broad, cordate, and auriculate, deeply lanceolate with a glandlike depression at base. Flowers large, yellow, the lobes convolutely imbricated, capsules long and large, ovoid at base, much pointed or acuminate at apex. Seeds 7 to 9, adhering firmly to each other, sometimes forming a cone, sometimes a kidney shaped mass black and naked, free of fuzz, having only the long wool, which is easily separable from the seeds.

This includes (from the peculiar adhesion of the seeds) the Cotton of Pernambuco, Brazil, Bahia, Peru, Egypt and now of many parts of India, where it is acclimated. In this District, it has been regularly cultivated in small quantities, for upwards of half a century, by the natives. The Cotton is much esteemed by Brahmins, for the manufacture of their sacrificial cords. It is also in great request by the weavers of

this neighbourhood. My attention was directed to this variety under the name of Egyptian Cotton in June 1857, by an invalid officer, who had procured a few seeds from a French gentleman, by whom they were obtained from a friend, who had brought them from Cairo; and who stated that the same kind of cotton was cultivated at Algiers.*

This cotton appears to have been introduced into Egypt in the year 1820, by a Turkish officer, named Maho Beig; he having brought the seeds with him from Ethiopia, as he had been for some time Governor of Dongola and Sennaar. It was, subsequently, greatly extended in Egypt, by the interest and exertions of a Monsieur Jumel. The produce in 1820, was only three Bales which were shipped to Trieste; in 1824 it had increased to 14,827 Bales.

4. *Gossypium Barbadosense or American Cotton.*

Perennial, stem shrubby, 6 to 15 feet; smooth; leaves, the upper three-lobed, lower five-lobed; lobes ovate, acute, smooth, often pubescent on the under surface, with one to three glands; stipules awl-shaped; leaflets of exterior calyx large, deeply lanceolate; flowers yellow; capsules ovate, acuminate, smooth, three to four, sometimes five celled; seeds 8 to 12, free, oblong, black and without any other pubescence than the long, fine and easily separable Cotton; but in some varieties, and apparently in its original Mexican form, covered with closely adhering down. In India, one variety is known as Bourbon Cotton, from its having been first introduced into India from the Mauritius. Its varieties, under the names of "Sea Island," "New Orleans" &c. are grown in the West Indies, Anguilla, Mexico, on the banks of the Mississippi, Terra Calienta, Vera Cruz, Valladolid, Isle of France, the Sea Islands of Georgia and Carolina, Egypt, and now in small quantities in many parts of Southern India, where it

* The Brazil and Bourbon cotton are cultivated in Egypt and are both indiscriminately termed Egyptian cotton.

has been grown for more than half a century. It is from this species that the best kind of Cotton, known as Sea Island, is obtained. Many of its varieties are much appreciated.

2. Sterculaceæ.

1. *Eriodendrum Aufractuosum*, (*Bombax pentandrum*) or silk Cotton Tree, has long been known to produce a Cottony substance surrounding its seed, but it has not sufficient tenacity to answer for manufacturing purposes. It is characterised by large trees, with compound leaves, and occasionally unisexual flowers, resembling the *Malvacæ*. This tree fruits largely, and, at an average, yields from 500 to 1000 pods. The average contents of a single pod are 90 grains of silky, Cotton wool and 120 grains of seed. The tree fruits at the age of 5 years, and continues to do so for 50 years and upwards, requiring no culture whatever. But the young pods and flowers should be protected from Flying Foxes, Squirrels, &c.

2. *Salmaalía Malabarica*, (*Bombax heptaphyllum*) or wild silk cotton tree is also a large statoly tree. The seeds of the pods are surrounded by a cotton like that of the *Bombax Pentandrum*. The cotton is more silky; but in consequence of the pods bursting early and scattering their contents to the winds, is seldom collected. Although the fibre is too short for manufacture, it is found useful for stuffing pillows, cushions &c. In the Northern District it is so common and held in such insignificance as to be sold at 8 annas a maund, the natives chiefly use it for making massive pads for horses and bullocks employed to carry baggage.

3. *Bombax Gossypium*.* Another variety of the silk cotton

* *Cochlospermum Gossy.* tree. The silk is rare and more esteemed than that of *Salmaalía Malabarica*.

3. *Asclepiadaceæ*.

1. *Calotropis Gigantia*, or Madar plant belonging to the milk weed order. This plant is found growing in all uncultivated

tivated places. There are two species. The plants are shrubby and yield a milky sap from every part. The follicles contain a silky down like cotton. It has been woven into cloth in the Jail at Chingleputt, by mixing with it one fifth of cotton: and in England it has been manufactured, by itself, into various articles, by Messrs. Thresher and Glenney, with sufficient success to deserve attention to encourage further trials.

2. *Demia Extensa* (Cynanchum Extensum.)—A genus of plants belonging to the natural order “Asclepiadaceæ.” It has a turning stem, with opposite leaves. The follicles are in pairs, are covered with prickles, and filled with a light silky cotton. This plant has also, of late years, received some attention, and the down has been spun and woven into cloth.

3. *Asclepias Volubis*. This plant also belongs to the natural order Asclepiadaceæ. It has a turning stem with opposite leaves. The follicles are in pairs, covered with a brown scurf and contain the down like cotton which is much shorter in the staple, than any of the others of this family.

These form the chief cotton producing plants; there may be others with which I am not acquainted, but they are not of sufficient importance to require notice here.

Cotton from every one of the plants enumerated above, varying in quantity from one to five pounds, have been forwarded by me to the London Exhibition of 1862; and from the Gossypium family to the Manchester Cotton Association, through their Honorary Agents Messrs. J. Line and Co. of Madras.

III. CULTIVATION OF THE PLANT.

Cotton is a soft downy material which envelopes the seeds of various plants, especially those of the different varieties of *Gossypium*, from which also the Cotton of Commerce is procured. It is known in Tamil as Paratee; in Hindustanee Kulpas, or Roohie; in Teloo goo, Thuthee, and is very extensively cultivated in India.

The foreign species, *Gossypium Peruvianum*, and *Gossypium Barbadense*, have been acclimated in India for nearly half a century, but owing to the indifference of the natives of India to exotics, their cultivation has not extended so far as one might have expected, from their being so much superior to the indigenous species.

Cotton belongs to the natural order *Malvaceæ*, or mallow order; which is indigenous to the tropical parts of Asia, Africa, and America. All the varieties of this order produce either herbs, shrubs, or trees, having palmately divided leaves, often stellate, hairs, and showy involucrate flowers on axillary peduncles; sepals five, rarely three, or four, united at the base, valvate, often having an epicalyx. Petals of the same number as the sepals, twisted. Stamens above twenty; monodelphous; united to the claws of the petals; anthers one celled, kidney shaped, opening transversely on the side next the pistil; pollen covered with long very harsh hairs. A many celled ovary with placenta, in the axis, or several ovaries separate or separable, when ripe. Styles equal in number to the carples; distinct or united. Fruit composed of one or several seeded carples, either combined or separate; seeds with little albumen, embryo curved with folded seed lobes.

Gossypium is a shrub belonging to the mallow order, with showy flowers, and an erect branched stem, with stipulated palmately divided leaves which are alternate, large, lobulate, and more or less pubescent. The inflorescence solitary with axillary, pedunculated, involucrate flowers. The follicles large or small, and, more or less ovoid at the base, and acuminate at the apex, containing 3, 4 or 5 cells; seeds 7 to 15.

The plant is a perennial; flowering and yielding fruit for several years.

The foreign cotton has been cultivated in the Coimbatour, Tinnevely, Bellary, Malabar, Mysore, Madras, and a few other districts.

The natives, to whom the cultivation is almost entirely con-

finer, seem to have a prejudice in cultivating the exotic species, and this has been done only to a small extent by them and a few European Amateur planters.

Hitherto, the cultivation has been carried on in a rude, and indifferent manner, and that attention, which its importance demands, has not been paid to so valuable a product. For a much more productive and therefore a more remunerative result (by which I infer a high improvement in the staple) greater care and attention in the cultivation of the plant is necessary than has yet been bestowed upon it.

In the culture practised by the native planter the soil selected is black, soft, and porous and is well known as the Regur or "*black cotton soil*," composed of decomposed basalt. The seed used is generally of the indigenous sort and the ground intended for its reception is prepared by being ploughed up a few times; manure is seldom used, but in some districts the usual dung heaps or wood ashes are lightly scattered over the ground, and should cattle not be allowed to enter the fields, the leaves and twigs of the previous year are frequently permitted to remain on the ground to form manure.

As a general rule cotton fields are not irrigated,—the ryot has therefore to depend for the successful growth of his crops on the periodical rains.

The seed of his own growth or of the same district is sown over and over again, each successive year, and this appears to have continued for centuries. It is prepared for sowing by being steeped in a solution of cowdung and dried in the sun to prevent it sticking together; mixed with dry grain or pulse and sown broadcast; in some districts the seed is sown in parallel lines alternately with pulse by means of a drill.

The sowing takes place in some districts as early as June, but seldom later than September, depending to a great extent on the particular seasons.

The seedlings appear between the third and seventh day, and ~~when~~ they are three weeks old, the plantation is hand

weeded, which process is repeated some two or three times during the growth of the plant. Frequently when the seedlings are but a fortnight old, a plough is run through the field to loosen the earth as well as to facilitate the removal of weeds.

The plants though generally considered to be herbaceous are found to be more or less woody and are full grown shrubs, varying slightly according to the particular kind of seed sown.

The plant generally begins to flower about the 4th and to ripen its fruit at about the 6th month of its growth, but in some rare instances, this does not take place until the eighth month.

The cotton wool of the several varieties in general cultivation in India, during a favourable season, is of a fair quality and the staple is even silky, and each fibre is strong; but in an unfavourable season those qualities are seriously deteriorated from the dearth of moisture.

The naturally rude and careless manner in which the native is known to conduct all his agricultural operations is here pre-eminently discerned in the cultivation of cotton, and this at once accounts for its usual deficiency in quality; and it is surprising to witness, even under these disadvantages what a large amount is turned out in a tolerably fair season.

The pods, as a rule, are not collected as they ripen, but are allowed to remain until the whole crop of the field is ready; and so little of importance is attached to the speedy collection of the harvest, that even then the ryot consults his own convenience rather than the importance of his duty. In many instances he is either unable to procure labour, or has not the means of doing so; often he is not permitted to gather in his produce in small quantities as the fruit ripens, but has to await the pleasure of the merchant from whom he has received an advance and frequently the crop has to be assessed, before he is permitted to gather it, during which delay, in most instances, two thirds of the produce fall to the ground where it becomes mixed with dust, and the debris of the standing

plants, &c.—and should it happen to rain during this interval 50 per cent of the produce is irretrievably lost. In some districts the ryot gathers the early pods, so as to be enabled to come early into market. It is then cleanly gathered. But when the cotton season has fully set in, the price fluctuates, and the ryot being in no hurry to enter the market, thinks the produce may just as well lie in the field as in his house.

When the cotton at last is gathered no care is evinced in removing the dried leaves, and other extraneous substances found attached to it, but it is generally taken off with all these impurities still clinging to it, and thrown into some receptacle, generally a large open Bamboo Basket, and carried to the stack yard, where it is heaped up amidst the dust or flue which necessarily abounds there. I have often witnessed heaps of cotton both cleaned and uncleaned lying exposed to wind and weather.

The produce thus collected is next freed from seed. This operation is, at the best, conducted by means of an Indian Churka. The cotton, as brought in from the field, is freed to a certain extent of its capsules, stalks, leaves &c., and then is submitted to the Churka; but in most districts the cotton is spread out on a common charpoy or country cot, and beaten with switches, when a portion of the minute particles of earthy or other extraneous matter still adhering falls through; but from the previous slovenly mode of gathering the cotton, no effort, however persevering, can now entirely free it from its impurities.

The beating or thrashing is more intended to loosen the wool from the seed, to which it adheres rather tenaciously, and in order to facilitate the operation of ginning by means of the Churka, which is a small primitive hand machine composed of two horizontal cylinders, the right end of which is constructed on the principle of the Archimedian screw. On the wool being slightly loosened from the seed, and held

between the two cylinders, which are fixed in close contact and revolve in opposite directions to each other, a layer of cloth is fixed beneath the rollers, and fastened to the uprights of the stand, which is to separate the seed from the wool, as it passes through the cylinders.

This operation is generally performed by females, who hold the seed cotton in the left hand to feed the cylinders, and with the right simultaneously turn the Churka; the cotton is thus drawn between the cylinders, whilst the seeds are by the counter-revolution of the cylinder repelled back, as they are unable to pass through from their size, and fall to one side of the machine, the cotton falling off on the other compressed into a fine layer. A woman, by manual labour alone, can clean only about four pounds of cotton, whereas with the Churka, she can free from about *Twenty five*, to *thirty* pounds in a day of 10 hours. The cotton is next baled. This operation is thus managed. •

To a strong, perpendicular, wooden post, a cross piece like the balance of a scale is suspended, the post being partly buried in the ground, and to the cross piece, a bag of cumby or gunny is attached, intended as a covering to the bale. From 5 to 6 maunds of cotton are now thrown in, and pressed down by a few men who jump into the gunny and compress the cotton with their dirty feet. From six to ten men are sometimes thus employed, whilst others are engaged in bringing the sides of the covering together, and securing them by sewing. In some places the gunny bags are hung by three ropes from the roof of the house; a fourth being free in the centre, is also attached to the roof, to which the men stamping the cotton hold on; these bales vary in size and shape, being adapted to the mode by which they are conveyed to the nearest market for export, and which is either on pack bullocks, or carts. From the time the cotton is gathered to that of export it passes through several hands who, from interested motives, adulterate the wool in various ways.

The price of cotton varies according to the particular locality in which it is cultivated, and to the distance of export. The average price of a pound is about one anna.

Foreign cotton has been cultivated by the Natives much in the way above described.

The American plan of ploughing the land and forming it into ridges varying in breadth from 2 to 5 feet, according to the nature of the soil, and the particular variety of cotton, was tried by Dr. Wight in the Coimbatour district, and is thus described by him. "The method of sowing in Coimbatour is to run a slight furrow from an inch and a half, to two inches deep, with a country plough along the centre of the ridge, in which the seed is pretty thickly scattered and covered by running over it a small triangular harrow." When the plant is three or four inches high, and beginning to put forth the third or fourth leaf, it is thinned out or "scraped" that is the greater part of the superfluous plants and weeds are scraped out with the hoe. This operation is repeated in 10 or 12 days, to complete the thinning and superficial cleaning of the land. About this time, or a few days later, the plant is sufficiently advanced to admit of the plough being used between the rows. The plough used is small and light, such as can be drawn by a single bullock with it; a light furrow is run within 5 or 6 inches of the plants, turning the earth inwards towards the roots to supply the place of that previously removed by scraping. This operation of banking up the roots, is completed with the hoe. If the soil is foul, and at the same time soft enough to be easily worked, the ploughing may "be repeated several times the more effectually to destroy weeds."

We shall now consider the cost of culture by the Ryot of one acre of dry or poonjay land with cotton, according to the native system, without the process of irrigation.

	Rs. As. P.		
Ploughing (for four operations at 8 annas each),	2	0	0
For 10 seers of seed	0	4	0
Weeding	1	0	0
Sowing	0	4	0
Picking the cotton	0	4	0
Cleaning the cotton	0	8	0
Land tax to the State	2	0	0

Total Rs. 6 4 0

The average produce of one acre of land is 220 pounds of seed cotton, which when cleaned will produce 70 pounds of clean wool, which at the market rate of two annas per pound, will yield 8 Rs, 12 annas; from which deduct the foregoing outlay of 6 Rupees 4 annas, and we have a clear profit of Rupees 2½ accruing to the ryot or cultivator.

The average produce of an acre of course fluctuates greatly, arising from the rude process which has been adopted throughout.

The cost to the merchant or exporter is as follows :—

	Rs. As. P.		
Cost of 70 pounds of cotton	8	12	0
Expense of carriage to seaport	2	0	0
Freight at about 35 Rupees per ton...	2	0	0
Screwing, baling &c	0	8	0
Commission, brokerage, &ca	0	8	0

Total Rs. 13 12 0

We see plainly by this that the produce of one acre of cotton costs Rs. 13—12—0 before it reaches England and to this must be added the profit anticipated by the merchant which in a great measure depends upon the state of the market at Home. The cost per pound will stand him at about 3 annas 1½ pie.

“Having briefly detailed the native, and American mode

of cultivating cotton as well as showing the costs, and profits attendant on the former, we shall now proceed to suggest improvements, which if adopted, cotton of a superior quality will be obtained, and in sufficient quantity to remunerate both the ryot and the merchant, and thus instead of being the very poorly remunerative article, which at present it is considered to be, will prove a well paying investment to labour and capital."

Pursuing the original plan we shall consider first the improvement necessary in cultivating, regarding the selection of of the soil, ploughing, kind of manure, choice of seed, sowing, and mode of irrigation, weeding, &c.—these being points of importance we shall consider each separately.

Selection of soil.—Care should be taken in the selection of the soil in as much as it is of the greatest importance that it should be clean and in good condition, the land should be manured and well farmed. To carry this out more effectually the chemical elements necessary for the proper nourishment of the plant should be ascertained to exist in the soil, and this state maintained during its growth, and the manner in which the root descends should be kept in view.

Though it has been considered to possess a tap root, I have found it always to consist of a tap root surrounded at its base, or part connected with the stem, by many and large sized, branched roots, with rootlets attached, and these enter the soil in all directions penetrating directly downwards as well as horizontally outwards.

Well drained land neither too stiff and clayey, nor too dry, firm and gravelly, neither too rich, nor too poor should be selected. A gravelly or red, loose, sandy soil, having a decaying granitic subsoil in its composition, is the one in which exotic cotton will thrive best.

When however the cotton grows too rapidly, as is the case when the soil abounds with humus "stimulating it into soft and sappy luxuriance" increasing the formation of wood, and

leaves instead of flowers and fruit the plant is rendered either sterile, or much less fruitful.

In the selection of land for plantations it should be borne in mind that, for the success of the operator, a more or less moist soil is necessary, so that the land should not be too porous to admit of free evaporation. Soils too abundantly supplied with moisture, or wet lands, have been tried, and rendered productive by adopting the system of ridging, and during the rainy season, trenching, or subsoil drainage of the land to avoid swamping, which if it does not destroy the plant entirely by rotting the roots, the other ill consequence of sappy luxuriance, &c. will ensue.

When the soil is moderately loose, it facilitates the descent of the root. A fair crop may be grown on land known as the common black cotton soil, provided attention is paid to drainage and the lightening of the soil by the addition of sand, as the earthy parts of the soil are useful in retaining water, so as to supply the roots with the necessary proportion of moisture, as well as to the correct distribution of the animal, and vegetable matter, which by being thoroughly mixed with it prevent them from decomposing too rapidly. In selecting land, advantage should be taken of localities where facilities exist for sinking wells, so that in dry weather irrigation to a small extent might be brought into play to give moisture to the soil; more especially during the infancy of the plant, and when it is in blossom.

These are the only periods that it will require water. In infancy to give nourishment to the seedlings and enable them to take root, and when blossoming to give staple to the fibre and improve the quality of the cotton wool.

Land having been chosen, special care should be given to ploughing. The ground should be ploughed so that at least a foot of the soil is turned up, and care should be taken now that the grass and weeds are thoroughly eradicated, and carefully collected from the ground and burned; and when their ashes will serve as manure. Weeding therefore should be

most carefully attended to, as if the roots be not thoroughly exterminated, they will certainly spring again, and be a source of never ending trouble subsequently. This being accomplished, every part of the earth should be exposed to the action of the sun and properly manured. Sufficient attention has not been given in this country to agricultural operations. We have already described the indifferent manner in which this plant in particular is cultivated; manure is seldom or ever supplied, the same rude process of manuring which has been in existence for centuries continues to be carried out in the present day.

The chief manure on which the ryot depends* for his agricultural operations, is the dung heap, or wood ashes.

In the use of manure it is not the quantity, but the quality that requires attention, which principle is not appreciable by the native ryots. They therefore allow the manures to be exposed to the influence of the sun and air so long, in most instances, that their essential ingredients become exhausted, leaving nothing more than undecomposed rubbish behind. This satisfies the ryot, because he perceives no great loss in the quantity.

It is beyond dispute, that plants thrive only in certain soils which possess the necessary mineral, and vegetable products required for their structural formation, or such as are found to exist in their ashes, so that cotton from belonging to the family of malvaceæ, requires according to the analysis given in another part of this Essay by Dr. Mayer, a soil richly supplied with Potassa, Lime, Magnesia, &c. It therefore becomes incumbent on the agriculturist to supply these to the soil with a view to enrich it should it not already contain a sufficient quantity, and if this be carefully attended to, and the necessary supply of moisture added, almost any soil might be rendered productive and suitable.

* All the necessary minerals can be readily obtained at little or no expense by the combination of wood ashes and farm-

yard manure, in about equal proportions, and by simply substituting a dung pit for a dung hill. For this purpose the pit may be faced with stone or metal, and brushwood, the refuse of the farm yard, straw, decayed leaves, &c., with which every Indian village abounds, should be thrown into the pit; the pit should be lined to the thickness of a foot at its bottom and sides. In addition, the washings of meat, fish, rice, dead animals, as dogs, cats, and other carrion, human urine, and ordure may be added.

“To deodorise the pit and prevent its becoming offensive, as well as to facilitate the decomposition of animal and vegetable matter, and to supply the chief elements in the structure of the plants, a small quantity of fresh lime should be occasionally thrown in, so that in a few months a valuable quantity of manure may be obtained, rich in fertilising properties and containing the necessary ingredients for the nourishment of the cotton plants.”—The pit thus prepared should be covered over with thatch, so as to protect it from the sun and rain.—This subject only requires to be understood in its practical application to be generally adopted by planters who will thus realise double and even treble what is at present their usual crop.—This is the kind of manure required for the cultivation of cotton, and by which a luxuriant crop with improved quality, quantity, and staple, will be obtained, for it is evident that the quality of the wool must depend upon the health and luxuriance of the plants.

“Manure prepared after the manner described will in 12 months be sufficiently disengaged from putrefaction to be distributed over the ground. It should then be carted away to the fields, in the cool of the afternoon, and on being laid over the field it should be covered over, in order that the manure may at once become mixed with the soil, and thus prevent any of its volatile ingredients being dissipated by exposure to the atmosphere.” But in subsequent dressings each plant should be carefully dug around to the depth of from 3 to 6

inches from the stem, and the excavations thus made filled up with manure and then covered over with the soil.

In the cultivation of foreign cotton, after having decided on the particular variety to be tried, some care will be necessary in the choice of seed, which should be fresh, as it does not in most instances, keep well, or maintain its vitality for any length of time. Instead of the seeds which are directly imported, preference should be given to that which has been acclimated—if even by only one sowing. Yet it would be advisable not to continue to plant the same seed within the same district beyond some 5 or 7 consecutive crops.

When freshly imported seeds are used a number will fail to germinate, and for which allowance should be made, and in order to fill up blanks in a plantation, it would be a good plan to have nurseries prepared at the same time from whence the seedlings might be transplanted, as required on the plantation from time to time.

The cotton is a hardy plant, and if watered for the first week after its transplantation will get on. I have frequently pulled plants up by the roots at various ages, and on replanting them they readily established themselves in their new locality—by aid of a little watering.

The most hardy varieties are the Brazil : next to it the Bourbon ; and lastly the New Orleans. The last of these is rather delicate, and will require more care, but it is the best variety for cultivation.

There appears to be a want of vigour in the newly imported seeds, for they do not come up so well and readily as those that are acclimated, which might be accounted for by the long time which elapses before they reach this country, and the atmospheric vicissitudes they must undergo in the course of their transit from their native country. There is invariably a loss of one third, sometimes of one half in the use of newly imported seeds.

The acclimated seeds in every instance exceed the foreign

in growth, vigour, and luxuriance, appearing in from 3 to 5 days, while the foreign takes from 5 to 15 days to sprout up, but by attention to the plantation during the first two weeks, the loss of seed that takes place might to some extent be removed.

One peculiarity in the sowing of foreign seed is certainly strange, its germination appears to take place contrary to all physical laws in vegetable growth, for from some unexplainable cause the radicle, instead of the plumule, shoots up into the air, and when the seed lobes have exhausted their store of nourishment, the seedling withers away.—In a few instances the radicle arches down towards the earth on reaching which it strikes root, and establishes itself successfully; advantage must therefore be taken of this latter fact; the plantation must be examined when the seedlings are springing up, and in every case where the radicle appears first it must be reversed by turning the seedling so as to place the radicle downwards, and this when once seen can never be mistaken, though to one unacquainted with the peculiarity, the radicle from its stumpy appearance is apt to be mistaken for a plumule deprived of its seed lobes, supposed to be destroyed by insects &c.

It is also necessary to satisfy oneself as to the soundness of the seed, for if they have not been carefully preserved, rats are likely to have destroyed the cotyledons, and in those varieties which are covered with down, the opening made by the rats being very small is covered over and hid from view unless closely examined.

The larvæ of a small brown moth is very destructive to seeds, and attacks them before the pod ripens, the opening in the seed is in most instances so small that it is not visible at all, but the cotyledons are destroyed, and the cavity is supplied with the dung of the larvæ, which gives consistency to the seed, and here also occasionally the opening is covered with the downy exterior of the seed and cannot be seen easily; a few

seeds must therefore be taken out and carefully examined to ascertain whether or not they be sound.

It should be made an invariable rule to collect seeds from those plants that are well grown, and from those pods which possess best and finest staple. In this country especially, too much stress cannot be laid on this subject; for on it will depend the future success of cotton in India. The seed must be procured from the finest specimens obtainable.

The cultivation of cotton here being entirely dependent on the rains, seed is sown according to the different seasons. In those localities subject to the influence of the N. E. monsoon the seeds should be sown early in September, should facilities exist for irrigation, thus to advance the plant and give it the full benefit of the approaching seasons. But should such not exist, advantage should be taken of the first shower of rain to put down the seeds.

In the Brazil cotton, the plants should be from 6 to 8 feet apart, and in the other American varieties, 6 feet apart from each other. They should be sown in lines, each being about 4 feet distant from the other, and in no instance should the plants be nearer than from 3 to 4 feet. Into each hole from 3 to 5 seeds should be placed, within a depth of one inch. If the seed is placed deeper it does not generally germinate, from not receiving the necessary supply of air, and in most instances it becomes rotten. In large plantations, either the native or the American method may be practised with advantage, although they entail a great loss of seed. That is, after the soil has been prepared, light and straight furrows in parallel lines from 3 to 4 ft. apart are run through, with a common plough, varying in depth from 1 to 2 inches. Into these, the seed is scattered pretty freely and then earthed over with the plough, and as the plants make their appearance and attain a height from about 4 to 6 inches they are gradually thinned out, leaving a single healthy plant at the regulated distance.—In no instance, should the Brazil cotton plant be

more than 4, and the other American varieties, than 3 feet apart,—Even for the Indigenous species, this distance should always be allowed between each plant, so as to encourage free branching.

The quantity, and quality of the produce will greatly depend on the healthiness and vigour of the plant.

Another advantage to be obtained by a due and correct regulation of the distances is that a free circulation of air will be allowed among the plants, which will be preserved in a healthy and vigorous condition; and as they grow up their branches will entwine with each other, and the leaves being fully developed the ground will be shaded and the injurious influence of a tropical sun, if not entirely overcome, will be considerably modified, and the rapid evaporation, which must otherwise occur, will be prevented. At the same time it will be necessary to keep the roots and stems free and clear of weeds, to maintain circulation of air by giving passage or leaving openings for currents of air to pass through.

If the soil was thoroughly cleared of all foulness before the seeds were sown there will not be much difficulty in keeping the plantation free of weeds now; but the few that may show themselves must be rooted out immediately. The seedlings will begin to appear from between the 3rd. and 15th. day, and occasionally even later. Those that come up first will in 3 weeks have attained from 4 to 6 inches in height, and thrown out from 5 to 7 leaves, during which period the whole plantation should be preserved scrupulously free from weeds and irrigated if necessary. The soil must now be loosened, not only around each plant but throughout the plantation. This may be accomplished by women with a hand hoe, any remaining weeds being carefully exterminated, and the plantation dressed with a fair proportion of manure, equal to three tons the acre. It should then be irrigated unless there are indications of a fall of rain.

A cheaper and easier mode of loosening the soil on a large

plantation could be effected by running a common plough between the rows of plants, taking care that the ploughing cattle do not either eat the young plants, or trample them under foot; a little care will prevent these destructive mishaps.

The plough will loosen the soil sufficiently, after which women and boys may be sent into the plantation to pick out the weeds. When the dressing with the manure and irrigation can be practised, acclimated seeds will be found to come up much quicker than foreign, and will be much healthier and more vigorous. Foreign seeds, even when they do show themselves, appear to sprout out prematurely; and although the plumule continues vigorous for a short time, attaining from 6 to 8 inches in height at the end of a fortnight, they become weak and sickly, remain stationary in growth, and frequently take on a light green, sickly hue, with the leaves curled up—Thus they continue for another week, by which time, they either thoroughly recover themselves, or continue to die away. Occasionally they continue sickly for some time, then die, seldom recovering if this has lasted more than a week or ten days. They are found less vigorous in their growth than those sprouts which have appeared at the proper time, for it seems natural that rapid growth, and premature decay should go together in organized structure. When the plants are three to four weeks old, is the time to see to the plantation having its proper complement of plants: should any of the seeds have failed to grow, or have been destroyed from accidents &c., their places should be filled by plants from the nursery.—When the plants are 6 weeks or two months old they will have attained from about 16 to 20 inches in height, and now the soil should be loosened and the earth manured, and if necessary, irrigated.

The growth of the plant will depend upon the quantity and quality of the sap that passes into its organs, and its modifications to the requirements of the plant by the principles of the atmosphere. All weeds should at the same time be carefully

removed, and this should be repeated a third time when the plants are three months old. After this all agricultural operations should to a certain extent cease, though the plants will require to be carefully looked after, in order that nothing may go wrong, and should the season fail in supplying the required moisture, the plantation must be irrigated.

Irrigation in cotton plantations does not appear ever to have been adopted except perhaps in amateur experiments carried out on a small scale. The plantation depending on the rains for success accounts not only for the fluctuation of the crops but in many instances for its failure.

The cotton plant requires rather a moist climate for its successful growth, and when cultivated on the scorching plains of India, will require partial irrigation to supply the moisture artificially to the soil, to render the speculation successful. There are no doubt many hill stations in India where the cotton plant will find a congenial climate. In the plains, if the seasons prove fair, the plants will only require partial irrigation, that is during infancy; so as to advance them sufficiently to profit by the succeeding monsoon, which if fair, will bring them to such a vigorous state of maturity as will enable them to bear with little injury any drought, should such a thing happen. The irrigation should also be used when the plants are in blossom, (if the rains have partially or entirely failed) as it will be necessary at this time to give them a sufficiency of moisture to enable the plant to secrete the necessary materials required for the formation of the cotton wool. For all the different substances found in plants are derived from water, which incorporating itself with the decomposed elements of the vegetable and animal substances in the soil itself, or that derived from the manure introduced into the soil, from the true nourishment of the plant.

Cotton plants will require to be irrigated only partially and, but once a week during dry weather, and once a fortnight if the season be fair.

The advantage of irrigation is not to supply the necessary moisture to the plants, but also to convey nourishment, dissolved in it, to the roots, and defend them from the effects of the heat; should water be too strongly attracted by the earth, the spongioles will be unable to absorb it; if in excess, or too loosely combined with the soil, it is likely to injure the fibrous parts of the roots.

“The usual method by which land is irrigated throughout India is either by a Picota or by the Moth. A Picota requires 3 men to work it, and a boy to distribute the water through the grounds. These will water about one acre of ground daily, and on an average cost 10 Rupees a month. The cost of erecting a Picota is about 16 Rupees” “The Moth requires a pair of bullocks with a driver and a boy; these will water about 3 acres of land daily and will cost about 13 Rupees per month. The cost for erecting Moth and purchasing bullocks will be 64 Rupees.” The preference should invariably be given to the Moth, as the bullocks will prove of double advantage in the conveyance of manure, and can also be used in ploughing, whilst the boy and man, when the moth is not at work, can be employed in clearing from 4 to 10 acres of land from weeds and insects. The plants having been brought forward, it will be necessary to make the plantation snug in anticipation of the monsoon; if this is not done, much damage is likely to occur from the rains, should they prove heavy; the plants should have their stems earthed up to the extent of 8 or 12 inches, and well laid out drains should be cut to carry away excess of water; and if the plants have attained 3 to 4 feet in height and appear very shrubby, their crowns should be thinned out as soon as an immediate indication of rain takes place; if not, from the size and extent of foliage, they retain a large quantity of water, the weight of which bears down the branches, and tearing them away from the stem, in many instances irretrievably injures the plant; or by making them top heavy with moisture, weighs them down to the earth and thus they

become altogether destroyed. The thinning out of the crown will add materially to the vigour of the plant, and encourage free branching. On the cessation of the rains the ridges should be levelled, the earth loosened around each plant, and trenches formed, so that if irrigation be required there may be no difficulty in supplying it subsequently.

The cotton plant from its soft and somewhat sappy nature readily parts with its contained moisture, and from the direct effects of the scorching sun the transpiration overbalances the absorbing power of the plants; it thus loses the required amount of moisture, which shows itself at first in the withering of the stipules, which is soon followed by contraction, and a brownish discolouration of the margins of the leaves, and drying of the young shoots &c. To protect the plant as much as possible, the plantation must be surrounded by a lofty hedge, and divided into moderately sized squares, and each square sheltered with some light and tall growing trees, so as to protect them as much as possible from the direct influence of the sun, and from the blasting effects of the N. East Winds. That which I find to answer the purpose best is the "*Aghati grandiflora*," which is a rapid growing plant, but does not become heavy in the crown; these when planted at the distance of about 3 feet from each other, will neither be too shady, nor a barrier to the free circulation of air.

The Brazil cotton plant will flower in from 4 to 8 months, and the other American varieties commence as early as in six weeks to bloom. From this period or time of flowering to the time of collecting the cotton, no other particular care is necessary except occasional irrigation when required, and protection from cattle, insects, accidental or other injuries.

It should be remembered that the foreign cotton can only be cultivated successfully and rendered remunerative, by cultivating it as a perennial, for as an annual it is not worth the trouble. As soon as the produce has been gathered in, and the plants cease to produce blossoms, they should be cut

down to within 6 or 8 inches of the ground, for the root stems contain the largest quantity of nourishing matter, but if they be cut down below what is allowed above, they will not in the next season branch out vigorously, owing to the fact, that that part of the stem which would have afforded the concrete sap for the first nourishment of the young shoot is cut away.

In pruning down the plant, care must be taken that that part of the stem which is allowed to remain, is not split or injured by careless hacking with a hatchet; a hand saw should invariably be used and the cut extremity of the stump covered with a mixture of clay, and cowdung, to prevent the evaporation of the sap. A few days after this operation, the soil around each plant, should be carefully and thoroughly loosened, either by a hand hoe or by running a plough between the rows, so as to break down all clods and loosen any weeds that remain, so that the latter may be effectually removed. The portion of the plant which is cut away should be allowed to remain on the ground to dry, and when the woody portion is being carried away, the dead leaves should be well shaken off to form manure to the soil;—after the ground has been loosened it should be dressed with manure and irrigated if necessary. The “ratooning” or cutting down of the cotton plant should not take place in very hot weather, a shower of rain should be looked for, and taken advantage of before the operation is commenced. The stumps, not long after this, will throw out a plentiful supply of young shoots. I find as a rule the plants begin to flower again about the month of September, and continue to flower and yield fruit to the middle of May following, at which time they again cease. The fruit ripens in from 6 to 8 weeks.

It is after this cessation of fruitfulness that the first shower of rain should be taken advantage of, to perform “Ratooning” again, and this routine of action can be continued from 5 to 7 years, care being taken that the plant receives its necessary

manuring, watering, &c. and the soil be kept free from weeds.

When once a plantation has been fairly started, all the precautionary means already alluded to being thoroughly enforced, much manual labour will not be constantly required for the future. But it should be borne in mind that with cotton each individual plant will frequently require to be attended to, more as an horticultural than an agricultural undertaking.

Physical features and climate where cotton should be grown in India.—

It is almost impossible at present to particularize the places in which cotton may be grown successfully, although experiments have apparently established that there are localities throughout India favourable to its growth.

The constitution of soils and the general peculiarities of climate in localities far north, are so very different to those of the extreme south, as is also the natural condition of the air, both atmospheric, and that mixed with the soil in both situations, that it is almost impossible to suppose that localities in these places so widely different, can be found to suit the cultivation of cotton. Besides these, the manipulation required to be adopted on both these soils has also to be considered closely. For instance there is the "Regar" or "cotton soil," the red clay or gravelly soil, (the latter my experience leads me to believe is better suited for the growth of Exotic cotton) and the common sandy washes lying nearer to the sea; each of these requires a different system of management. It is therefore necessary to consider the correct, and systematic treatment of these different soils in connection with the atmospheric changes to which each, or any of them, may be subjected, according to their several localities, in order that we may hope for success. But this is not, I think, to be obtained by simply growing the plant either far or near, or by shading or exposing it to the open air;—The planter should be

thoroughly acquainted with the particular nature of the climate and the quality of the soil.—Soils as well as climates differ very essentially in their nature; they vary, not only in their fertilising properties, but in the various influences they each exercise produce their respective action on plants during their different stages of vegetation.

The chief point is to force, without the aid of much extraneous art, the most flourishing vegetation. I say without the aid of much extraneous art, because if much of that was required, then the plant would never pay by its produce. It is here premised that it should be borne in mind that we too frequently overlook the influence of remote atmospheric conditions on certain plants, believing that so long as a plant is surrounded by an atmosphere of temperature similar to that of its native region, and planted in a soil of similar chemical composition, it must necessarily thrive; this can be better proved when we call to mind the diversity of climates in which cotton has been successfully cultivated.

Under the head of “experiments” is given the particular cost of each variety of cotton and the attendant expense of each acre, either as an horticultural or as an agricultural undertaking.—My experiments having satisfied me as to the success of the growth of cotton in this district, I applied for 50 cawnies of land to the Collector, for the purpose of cultivating it on my own account, who forwarded it on to the Revenue Board, recommending it favourably, to which the following order was passed.

Proceedings of the Board of Revenue dated 10th. September 1861.

I. Ordered to be submitted for the decision of Government. Dr. Shortt has been so much interested in the question of cotton culture, and so successful in his experiments, as shown formerly at the district exhibition, that the Board have no hesitation in recommending to Government that the fullest encouragement be given to his present enterprise

consistent with the necessity of its being conducted under conditions not more favourable than could be obtained by any ordinary ryot bearing the payment of assessment.

II. This need not be insisted on though the item must be included in the eventual valuation of the results.

(A true copy)

(Signed) W. HUDLESTON,
Secretary.

Order thereon 7th October 1861. No. 1,934.

I. The Government are precluded from acting on the Board's recommendation by the orders contained in the Despatch of the Secretary of State to the Governor General dated 24th. July 1860 printed in G. O. 24th. September 1860, No. 1,696.

(True Extract)

(Signed) J. D. SIM.
Secretary to Government.

METEOROLOGICAL OBSERVATIONS FOR 1861.

Exhibiting the monthly means of the Barometer, Thermometer, Direction of the Wind, and Depth of Rain in the Carnatic, prepared from the Tables in Madras Quarterly Journal of Medical Science.

1861.	Barometer reduced to 32° Fahr.				Thermometer corrected to the New observatory's Standard.				Direction of the wind.		Depth of					
	A. h. 9.	M. m. 41.	P. h. 3.	M. m. 41.	A. h. 9.	M. m. 41.	P. h. 3.	M. m. 41.	Maxim.	Minim.	A. h. 9.	M. m. 41.	P. h. 3.	M. m. 41.	Rain.	Evaporation.
January, ..	29.8921	29.873699	79.197	80.0235	81.8439	69.677	E.	E. N. E.	"	"	.316					
February, ..	29.8095	29.8934	79.111	82.1469	82.3615	67.1111	N. E.	E.	"	"	.281					
March, ..	29.16911	29.8326	84.6747	85.6487	87.812	72.7784	S.	S.	.332	"	.343					
April, ..	29.78551	92.737	75.5031	86.07069	78.80467	"	S.	S.	"	"	"					
May, ..	29.6697	97.2945.4	75.7141	88.1659	79.262	"	W. S. W.	S.	.411	"	"					
June, ..	29.717	97.563	80.0905	87.60047	77.4714	"	W.	W.	.215	"	"					
July, ..	29.7098	94.4876	79.8112	86.2945	76.8484	"	W.	W. S. W.	.39261	"	"					
August, ..	29.7448	90.7786	77.101	82.971	78.165	"	W.	S. W.	.11252	"	"					
September, ..	29.7664	90.694	77.5062	82.5711	77.4712	"	W S. W.	N. W. W.	.11678	"	"					
October, ..	29.843	87.00387	76.618	83.1982	76.434	"	N. N. E.	"	.487	"	"					
November, ..	29.306981	76.938	66.676	76.2386	73.037	"	N. E. E.	"	.2811	"	"					
December, ..	27.42564	76.4835	64.5528	70.529	67.2968	"	N. E.	"	.31	"	"					

IV. A DESCRIPTION OF THE DISEASES, INSECTS AND OTHER INJURIOUS INFLUENCES WHICH ARE DESTRUCTIVE TO THE COTTON PLANT.

The liability of these plants to suffer from heavy rains &c. and the measures necessary to protect them on such occasions have already been pointed out. It now becomes necessary to notice the diseases to which they are subject, but before doing so, it will be requisite to premise what their healthy condition is, or ought to be, in order to describe their diseased state; as this is a difficult subject for analysis, it will suffice here, merely to notice the various conditions under which health may be said to exist. For it is almost impossible to draw a line of demarcation as to where health ceases, and disease begins.

To endeavour to make the subject clearer we may be justified in stating that a cotton plant when in a perfect state of health, is of a deep, or dark green colour, the leaves being shiny, and complete in formation, and every other part of the plant indicating health, and vigor, as it passes through its successive stages of growth. The fruit ripening between the 6th and 8th month; the latter occurring a little earlier in some and later in other varieties. Excess of moisture renders the plant dropsical, and favours the formation of soft sappy wood with a luxuriance of foliage, and this excess of moisture dilutes the sap, and diverts it towards the wood and leaves, rendering the plant sterile or very scantily fruitful from a tendency to succulence. Should this occur when the plant is in flower the fruit becomes abortive, or does not ripen, but drops from the plant in an immature state, from the sap-bearing vessels getting gorged with the diluted secretion, they become ruptured, and the nutrition to the plant is thus cut off. The same abortive result may arise from an opposite state, viz., from the want of a due proportion of moisture in the sap to maintain the integrity of the plant, and thus a shrinking of the sap vessel occurs. In other words cultivated plants are subject

to an invariable tendency to disease, from two opposite causes. The excessive development of any particular structure is liable to destroy the equilibrium of the whole plant, with reference to its secretions, and this may be the result of physical causes existing either in the climate or soil of the locality in which it is grown. On the other hand it may arise from starvation, or from a state of semi-starvation, from the plant being wholly or partially deprived of the necessary ingredients required for its nourishment. In the one case starving the plant into dwarfishness, in the other developing it into sappy luxuriance. These states require only to be understood and they can readily be corrected by modifying the effects of the climate to a certain extent, and gradually acclimatizing the plant to its new situation, or by supplying the soil with the necessary ingredients in the way of water, manure &c.

The Exotic species require a moist atmosphere in addition to such ingredients as may be required for their nourishment, to enable them to maintain a healthy and vigorous existence, and render the plant fruitful.

Moisture in the soil influences its temperature, and the manner in which it is distributed through, and its combinations with the various earthly materials is of importance with reference to the nourishment of plants.

The scorching sun on the plains of India produces rapid evaporation of moisture from the soil, the continuance of which soon interferes with the health of the plant unless artificial means are resorted to in order to prevent this.

When the cotton plant becomes sickly, the first indication is a stoppage of the growth of the plant followed by the decay of the stipules. The leaves then change colour and become lighter and tinged with yellow, the lamina contracts and gets depressed in the middle, and the leaf becomes like a cup from contraction of the margin. In other instances the leaves curl up and the young leaves as well as the succeeding ones become dwarfed. The discoloured spots ultimately acquire a

brown colour and as it were slough away, leaving circular and irregular holes in the lamina. Sometimes the stem itself becomes cankered though frequently the plant continues to show a few flowers and even to ripen its pods. This is no doubt owing to the rapid and constant evaporation going on much beyond what either the climate, or soil can afford to replace, the sap is thickened from the loss of water, and immaturity favors the formation of flower buds, on its return to the stem.

That these results are produced by the climate there can be no doubt; even when sufficient moisture is given to the soil, the young shoots and tender leaves become scorched by the intense heat of a tropical sun; and as evaporation is more rapid in proportion as the temperature is higher, so the plant loses not only its superfluous amount of sap, but that which is really necessary is rendered less deliquescent at the time its ascent is quicker.

In proof of this I may adduce that these effects are visible in those plants only that grow in the open air; when sheltered by a tree, house, or other object, it flourishes well, and none of the effects above detailed are visible. The remedy is obvious, the plants should be slightly protected from the midday sun. But in doing so, too much shade should not be given, for then the plant shoots up tall and slender, without branches, and produces only sparingly. The way in which the plant should be subject to shade and protection, has already been explained.

Vegetables like animals are subject to ravages from parasites. I have found two kinds principally to infest the cotton plant, and from the examinations I have made under the microscope, they evidently belong to what are termed "*thallogens*" or "*fungi*"—They appear in the form of rounded fibres or thallus shooting up in the air, having the lamina of the leaf as a base and feeling villous to the touch. The small fibrillæ that form the nap appear shooting up as sharp projections when seen by the naked eye; under the microscope they are found to

consist of pointed tubes interspersed here and there with minute granular cells. It first attacks either the upper surface of petioles, or the margins of the leaf, gradually extending over the lamina, and matting together the whole leaf into a greyish white, felty, mass. At first it attacks the young shoots and tender leaves, preventing them from expanding. The extension of the parasite deprives the plant of its juices and eventually either destroys or renders it sterile. The spores seem to be derived from the atmosphere, and finding the plant in a state fit to receive them, from either the result of excessive cultivation, or from the effects of heat and want of moisture, rendering it unhealthy and thus favouring the reception of the spores of the fungi. Another variety speckles the leaves with whitish dots. These remain separate, but the lamina is covered with them and in time the leaf changes colour, becomes yellowish, and eventually dies away. This is evidently the disease called Bunt or some variety of it, as it is seated beneath the epidermis and eventually the spores escape. Under the microscope, they seem to consist of small dark cells or spots attached to a thread like Mycelium.

The only effectual remedy to destroy these parasites is to watch the plantation carefully and to remove every affected leaf the moment it shows itself and have them destroyed. In the early stages, ere the spores have become matured, simply removing them will suffice. Several remedies have been tried, such as solution of blue stone, common salt &c. but such will only be required in special cases.

Blight is more frequently the result of plant-lice, which will be noticed in connection with insects.

Insects and Animals destructive to Cotton.

Cotton plants are subject to ravages from caterpillars and other varieties of insects which frequently eat away the whole of the lamina, leaving only the midribs attached, and thus giving the plant a singular appearance and sometimes completely injuring it. Not only the leaves but the tender stems,

petioles, peduncles, flowers, and fruit are destroyed in turn by different insects. Considering the importance which the subject of cotton culture in India has now obtained, it will be necessary to enter fully into the consideration of these destructive insects, in order that they may be accurately described. This will not only tend to the advancement of science, but will also lead to some rational method of prevention.

Those only who have witnessed the ravages made by them can clearly understand how fields may be laid bare, and for the most part destroyed, perhaps in a single night.

Class VIII. Insecta.

Order IV. Rhynchota.

Sub-Order I. *Homoptera*.—The first of this group is a small oval insect which appears active in all its stages and is covered with a white cottony mass which is found to swarm with the ovas and young larva. On examination under the microscope, they are found to possess 6 short feet, and are seen to move pretty actively; the eyes are small, dark, and prominent. The larger ones are streaked with greyish white, having a pair of filaments proceeding from their posterior extremity. This parasite evidently belongs to the Coccidæ, and is extremely destructive, for from the moment it settles on the cotton plant, the latter never thrives but soon sickens and dies away.

The stem, branches, twigs and in some instances even the under part of the leaves, are covered with cottony substance, swarming with a colony of these parasites.

I submitted some to Captain Mitchell* for his opinion. He says, "The coccidæ, Gall insecta, mealy bugs, for by all these names are they known. These like all the Hemoptera have a Rostrum. In the coccis, our present subject, it is very long and contains three minute or rather delicate seta, with which it punctures the plant. The ova of the insect are found in.

* Superintendent of the Government Museum Madras.

considerable numbers, they were of a pyriform shape and measured $\frac{1}{1336}$ of an inch."

The second tribe of this Sub-Order is the Phytophthiria, or Plant lice.

The amount of damage done by this insect is almost incredible ; the plant swarms with it, and the juices from the shoots, leaves, and stems are extracted in such a way as entirely destroy them. The leaves are frequently rendered sessile by their laminae being fringed, from a shortening of the midrib and veins, whilst in some instances little gall like excrescences are produced on the young shoots; or they are distorted into a hundred fantastic forms, and sometimes entire plants are blighted by them.

There are a great many species, some of which are wingless. It is not necessary here to enter into minute detail of the natural history of the insect as it is well known, but it may casually be mentioned that by the saccharine secretion it possesses (known as honey dew) ants of many varieties are attracted to the cotton plant, and I have myself counted upwards of 30. But these are in some measure beneficial as they devour the larva of other noxious insects in their search after the honey dew.

Division III.—Group II. *Membracina*—Of this section a small insect with three horns, two arched on either side and the third over its back, is also found to infest the cotton plant and living on its juice. These also attract ants from a saccharine substance they secrete. The young of these crowd in millions over the young shoots.

Sub-Order II. *Heteroptera*—Of this class are the Geocores or land bugs ; some of them known as green bugs. Many species of the last group of this order (Scutata) are found on the cotton plant feeding on its juices.

Order VI.—*Orthoptera*.

Several insects of this well-known Order are very destruc-

tive. Of these the chief are the *Locustina*; and *Gryllina*; the larva of these crowd in thousands over a single leaf, through which they eat in a few seconds, and then descend to the adjoining leaf, and so continue their destruction. Some full grown locusts I have taken off the plant measuring nearly four inches in length, and the great green grasshopper (*Gryllus Viridissimus*) nearly 2 inches in length, and to this group belong the most destructive tribes, particularly when they make their appearance in large numbers.

Of the *Locustina* the *Locusta Migratoria* and the *Locusta Cristata* I have found. Of the insects composing the 2nd tribe, the *Gryllus Viridissimus* is common, and their larva commit a great deal of mischief among cotton plants.

Order VII.—*Neuroptera*.

Sub-Order I. *Dichatopetra*—Of this Order the *Termitida*, or white ants, and of these especially the *Termitis Tatalis*, commit a great deal of mischief. They are attracted by the dried leaves, &c., which drop from the plants, and subsequently making their way to the plant itself devour every plant that comes in their way.

Order IX.—*Diptera*.

Sub-Order II. *Brachycera*—Of this Sub-Order the group *Musidæ* or fly family. Several species of this genus infest the cotton plant, and deposit their ova on every part where decay is going on, whilst the larva is much more frequently found in the young pod, eating through the seeds, and materially affecting, even if it does not entirely destroy, the cotton. Some of these are of different colours, the larva are soft, footless grubs well-known by the popular designation of maggots.

Order X.—*Lepidoptera*.

Sub-Order I *Heterocera*.—The *Tineina*, or second tribe of this Sub-Order, are small moths, some brown, others dark

brown, and a third variety striated, having bristle shaped slender Antennæ, with a long and slender body, the wings being entire are long and narrow, the larva naked; some are slightly hairy, provided with eight or ten prolegs in addition to the thoracic members.

The ova appears at first to be laid at the base of the flower, but the larva, soon penetrating the young pod, feeds on the tender seed and wool, and by the time the pod becomes mature, the larva form their cocoons with a white downy cotton like substance, and escape in the form of the moth described above. By these a variable quantity, from two to three-fourths, of the cotton wool is not only completely destroyed, but the remainder left more or less soiled; another variety of this tribe form for themselves shelter in the young shoots, which they fret so as to cause them to dry, and in this they form for themselves a case in which they carry on their ravages; the larva is small, about 6 lines in length, of a light green colour, with a black head, and hairy, having 8 prolegs in addition to those of the thorax.

A third variety mixes itself within the young shoots, where it continues to exist extending its ravages some 4 to 6 inches, and in most cases to the destruction of the shoot. The larva are about 8 lines in length, slightly hairy, brown in colour, spotted with white, and as they enlarge they taper slightly towards each extremity. These have 10 prolegs in addition to the thoracic members. Their cocoons are formed of a white cotton-like substance, in which they enclose themselves.

The moth is brown with longitudinal green stripes. This tribe is extremely destructive to the cotton plant. The young shoots with flower buds soon exhibit signs of its ravages, and begin quickly to wither and die away when once this insect settles on the plant.

The *Tortricina*, or third tribe, of insects, better known as "leaf rollers," are extremely destructive to the cotton plant, particularly when they occur in great numbers.

The larva measures about an inch in length, slightly tapering at both extremities, divided transversely into 10 segments, and scattered over with short white bristles, generally of a dull white colour through which the dark green of the leaves it has fed on can be seen. The head is formed of a black cap or hood, and in some a second pair of hoods is visible posterior to the first, and the mouth armed with strong jaws; the three following or thoracic legs are black and curved like claws. About the middle are four pairs of fleshy tubercles, which look like stumps and constitute the prolegs, whilst a fifth pair proceeds at right angles from the last segment of the body. The ova are laid on the leaves, and the larva (on its exit from the ovum) is very minute, and threadlike: in a short time after this it begins to weave a light web over itself, and as it increases in size, draws the sides of the leaves and glues them together with its secretion. It then ascends to the upper part of the leaf and bores through as much of the lamina as is required. Having completed this, it now rolls the leaf into the shape of a cone or a cylinder, by folding one part over the other. Each larva forms a separate habitation for itself, and as the leaf is required to be doubled over, the insect has to cut through a considerable portion of the lamina. The bottom of the cylinder or cone is floored with a web, and strewn with its excrement in the form of minute black pellets.

The plants thus present rather a singular appearance with these cylinders or cones, three, four, or even five are sometimes seen suspended from the same leaf.

When the larva attains its full size it becomes somewhat transparent, and the dorsal vessel is seen pulsating at the posterior extremity propelling its contents onwards. This larva is extremely active; can move with rapidity, either forwards or backwards; and when danger threatens it escapes from its habitation by forming its body into an arch, and by suddenly straitening throws itself off the leaf to the ground, and in

some instances it continues suspended by a fine thread in its descent to the ground.

Having attained maturity it selects for itself a spot in the cylinder where it forms a web over itself and remains quiescent for from 24 to 48 hours, and about the end of that time the substance of its body shrinks, and then it assumes an opaque, light green, appearance, and then it is found enveloped in a membrane of brown colour, exhibiting no other symptom of life than a slight motion of its upper, pointed portion; and in 3 or 4 days after this, it emerges in the form of a moth, which is of a light brown colour, with dark stripes. This moth appears more partial to the Brazil cotton than to the other varieties though I have occasionally found them on some of the latter.

The *Geometrina* or *loupers*, as they are popularly termed, are also destructive to the cotton plant. The larva measures from $\frac{1}{4}$ to $1\frac{1}{2}$ inches in length, is of a cylindrical form, composed of 10 segments having 14 feet, three pairs, somewhat of a brownish colour, and slightly clawed next to the head, 3 pairs of prolegs, and to the last segment another pair placed somewhat at right angles to the body.

The larva is green in appearance with a light buff coloured head, having three longitudinal stripes along the back and sides; and intermediately to these 3 other stripes of a lighter colour and dotted white. It moves in one direction only by measuring the space it moves over by doubling or bending its body, and progresses by a succession of springs or jumps, and from which peculiarity it received its name. The moth is almost the same size as the last described, but of a brown colour, the upper half being dappled, of a very light, and the lower half of a dark brown.

In another variety of *Geometrina* or *Loupers*, the larva has 6 pairs or 12 feet, only about one inch in length, larger about the thorax, having 10 segments, and the back having prominent little tubercles; the larvæ are of two or three colours.

Some of them resemble in colour and texture a piece of dry twig, others are of a mottled yellow and brown; the moth from which this variety springs is white and prettily striped with black.

Of the tribe *Nocturna* the caterpillars are generally naked, or rather having a short velvety down, and slightly variegated in colour; the body thick, having 16 strong feet. The pupa is inclosed in a loose downy cocoon. The moth is dappled brown and white and is of a larger size than any of the others.

The *Catocolæ* or tribe of hairy caterpillars, having 16 feet from $1\frac{1}{2}$ inch in length. They congregate in numbers and are extremely voracious in their habits, feeding on each other in the absence of vegetable food. Their pupa is inclosed in a loose cocoon made of hair and other materials of its own secretion. The moth is of a larger size than the last named. The wings are of a dark dappled colour, having their posterior or under wings of a bright red and orange colour.

Order XI. *Hymenoptera*.

Suborder I. *Securifera*.—The *Phyllophaga*, or saw flies do a great deal of damage to the cotton plants either by attacking the petiole of the leaf, or the young shoot is perforated and ova deposited in it, and the young larva burrows in this, feeding on the pith and other tissues. By the time it has attained maturity the parts begin to wither, for the destruction has reached the alburnum, thus committing much mischief.

In the second tribe, *Xylophaga*, or tailed wasp, the larva is small, having only six small thoracic legs. It burrows in the wood of the shoots and occasions extensive mischief.

Order XIII. *Coleoptera*;

Section II. *Tetramera*.

In the first tribe of this section are the *Phytophaga*. It is of a brown colour, striped with black all round and intersper-

sed with white. They commit a vast amount of injury to flowers on which they feed.

Section IV. Pentamera.

The sixth tribe of this section is the *Necrophorus*, or burying beetle, these are chiefly destructive to the flower of the cotton plant, every part of which is greedily devoured by it.

It belongs to the family *Silphidae*.

Class V. Mammalia.

Order III. Rodentia.

The *Murida* or rat family are extremely destructive to the pods which they greedily devour in search of the tender seed to which they are particularly partial. Their depredations are generally committed at night, when they climb up the plants, and creep along the stem in search of the pods. This is particularly applicable to the *Mus Sylvestris* or long tailed field mouse. The amount of mischief committed by these animals is almost incredible. They take the pods and devour them at their leisure and frequently carry them off to their retreats.

Scuridae.

The *Scuirus cinerus*, or common grey squirrel of Southern India, is a very destructive little animal to the cotton plantation, which it infests at all seasons of the year, and destroys not only young shoots, but the green as well as the mature pods, in search of the seed of which it is very fond, as well as of the cotton which it carries off in large quantities, with which to furnish its retreat.

Of Ruminants.

Sheep or deer will not touch the cotton plant, goats occasionally do, and buffaloes and cows are very fond of it. More particularly when the plants are in flower cattle are attracted

by the smell, and if permitted to enter a plantation commit extensive depredations in a very short space of time.

Thus it will be seen that every part of the cotton plant is subject to ravages from insects every one of which I have endeavoured to describe briefly, giving their class, and order. It is however more difficult to recommend remedies for their destruction. But I have found lime, and wood ashes dusted on the plant, very efficacious in keeping away caterpillars. When infested with aphides I have found it a good plan to smoke the plants. It is readily effected with an earthen chatty. The chatty is stuffed with damp straw and any kind of dry combustible substance, to which may be added with the greatest advantage tobacco stalks, sulphur &c. A hole is knocked into the bottom of the chatty, through which a piece of live coal is insinuated and on being blown into, a cloud of smoke issues or is driven through the mouth of the chatty, and if this is done to the windward of the plant, the chatty being shifted from place to place, or several chatties being used at the same time, it is very effectual. Early in the morning is the best time for the operation. Dried chillies are a good substitute for tobacco stalks, or dusting the infested parts with finely powdered tobacco or black peppers is extremely effectual.

Sprinkling, or dusting the plant with a solution of tar, or creosote, will sometimes prove useful in destroying all kinds of insects; or sulphur in the proportion of one part mixed with two or three of quick lime, and boiled in a sufficient quantity of water to dilute it well, and sprinkled on the plants, is very efficient in keeping away insects. Worms and caterpillars, may be easily got rid of by picking them off the plants morning and evening, and destroying them immediately. I have found it an advantageous plan to keep poultry on the plantation after the plants have attained from 2 to 2½ months old, as they devour white ants, grasshoppers, and other kinds of insects. For this purpose the common guinea fowl, (*Numida Me-*

leagris) are the best; they are fond of roving about in search of food.

“Some knowledge of the habits of an insect is often required to enable us to check its ravages completely. When we are aware of the particular moths whose caterpillars commit the greatest depredations (by ascertaining the moth that proceeds from each) we must seek the most successful mode of preventing their propagation, and that is by destroying the female before she has deposited her ova.”

I have often succeeded by taking one or more moths alive, and confining them in either a gauze or net cage, and placing it in some part of the plantation at night. It will frequently attract others, which can be readily taken and destroyed; even if left till morning a few are generally found sitting on the cage which contains the decoy moth.

To destroy rats the usual traps with tempting baits answer sometimes; at others, thin slices of cork fried in ghee should be thrown about the plantation; this they devour greedily and are soon killed by it.

I have found different kinds of common grain, saturated in a weak solution of strychnine, very effectual in their destruction; but the most deadly poison, as well as the most efficacious, is made by dissolving 2 drachms of Phosphorous in a bottle of ghee: a portion of which should be mixed with boiled rice, and placed under large tiles, hollow bamboos, or in boxes made for the purpose. Crows, Poultry, or any creature partaking of either of these two poisons will surely die. The bottle containing the ghee must be placed in the sun till the Phosphorous dissolves. Keeping cats on the plantation, which should only be allowed to run loose at night, to prevent their destroying or frightening away birds,—which ought to be encouraged, for they contribute largely to the destruction of caterpillars, and other insects.

The common Mongoose, or *Herpestus Grisens*, is a capital rat catcher, but it is destructive to poultry. The planter will

of course select his aid for the destruction of vermin and insects according to the locality of his plantation and other attendant circumstances.

The most successful way of destroying squirrels is by enclosing a square foot of ground with four stakes driven into the earth and connected on all sides with pieces of twine, and on every side of the square some half dozen or more nooses made of horse hair should be tied to the twine and the bait of a plantain or a little sweet rice placed in the centre of square, surrounded by the nooses. This soon attracts the squirrels.

Several of these traps having been set, an attendant with a stick, about 2 feet long, and $1\frac{1}{2}$ inch in diameter, should be set to watch the traps at some little distance. The moment one gets caught in the noose, before it has had time to bite through, he should run up and strike the squirrel a smart blow on the head, and withdraw it, and adjust the noose ere he returns to his watch.

A whole community of squirrels might thus be destroyed in an incredibly short space of time. The same plan might be tried successfully with rats, if a trustworthy attendant could be got to watch for them at night.

V. EXPERIMENTS WITH

A. *Indigenous Cotton.*

I conceive that an account of the cultivation of the different species of cotton as grown, for experimental purposes, under my own immediate supervision may prove interesting; especially as their whole progress from the time of sowing the seed to the ultimate gathering of the crop was carefully watched and noted by myself; and I have been the more exact in detailing them, as they are in general neglected in India.

A. *Indigenous Species.*

1, *Gossypium Herbaceum*, or Indian Cotton. Tamil, *Oopum Paratie*.

On the 31st of May 1861, a piece of land at Chingleputt 95 square yards was well prepared by free delving, and some seeds of the above named species from Bellary, which had been previously acclimated in the district, were sown in parallel rows 4 feet apart, and which germinated between the 3rd and 7th days after sowing. They were irrigated on 9th of June, and the seedlings well thinned out to the distance of about 18 inches apart, leaving 150 to grow; these had attained about 4 inches in height, and had each thrown out between 3 and 5 leaves. On the 14 and 16th they were again irrigated, and on the third of July they had attained between 6 and 7 inches in height. On the 3rd of August they were clear of weeds, and the earth loosened around them; but they were not irrigated, as a few light showers had fallen in the interval. They were now lightly manured with the common farm yard manure. Average height of plants 18 to 20 inches; descent of root, 7 inches; and lateral shoots are making their appearance.

3rd. September. The plants are kept free from weeds, and the earth around them loosened. Average height of plants 4 feet and lateral branching proceeding freely; a few have put out flowers.

3rd. October. The plants have attained 6 feet in height, are looking shrubby and very healthy. A few flowers appeared, but were thrown down by some heavy rain. The ground has been kept scrupulously clean.

November 3rd. Fearing that the plants were likely to run into excess of wood and leaf, as some have nearly attained the height of 7 feet, they were checked by pinching off their tops. The N. E. monsoon having commenced with heavy rain, during the 7th and 8th of November some of the plants were thrown down, and to prevent a repetition of this, their branches were thinned out, and earth ridged up against the root stems nearly the height of a foot.

3rd December. The plants are in full blossom and are forming fruit.

3rd January. The plants are covered with bolls, which on the 3rd February commenced ripening.

23rd March.—Gathered the produce amounting to 30lb of seed cotton, giving when cleaned 10 lb of clean cotton wool.

The expense of cultivating the above plot of ground.

							Rs.	As.	Ps.
For preparing soil,	...	...	...	...	...	...	0	2	0
Seed,	...	...	...	...	...	...	0	0	3
Watering,	...	...	...	...	...	...	0	2	0
Weeding,	...	...	...	...	...	...	0	1	0
Picking,	...	...	...	...	...	...	0	0	5
Cleaning,	...	...	...	...	...	...	0	1	1
Land rent,	...	...	...	...	...	...	0	2	0

Total, 0 8 8

At the above rate one acre will contain about 7,650 plants ; and the average cost will be 27 Rs. 9 anas, 6 Pie. The produce will amount to 500lb of a superior quality of cotton, which even at the usual low rate of the ordinary Cotton of 1 anna per lb, will yield 31 rupees 14 annas per acre. From which, if we deduct the cost of culture 27 Rs. 9 annas and 6 pie, a clear profit of 4 Rs. accrues to the ryot. But were such operations conducted on a larger scale, the outlay would of course be much less, and the produce greater in proportion to that given above.

2. *Gossypium Arboreum*, or religious cotton of the natives, Tamil "*Shemparatie*." A plot of ground measuring 30 square yards was well prepared, manured lightly with the ordinary manure, and on the 18th of June 1861, was sown with seeds from the above named species, which had been produced in the district. The seedlings began to show themselves between the 3rd and 6th days, and on the 18th July had attained from six to eight inches, when they were weeded, the earth loosened, and the roots watered. On the 18th August about 40 plants were left on the land, each 18 inches

apart, and they had attained a height of from 12 to 15 inches, when they were again weeded, the soil loosened, and watered. These plants were on the 18th September three feet high with a few short lateral branches, which within the succeeding thirty days had become considerably extended, and a few exhibited flower buds, which however were knocked off by a heavy shower of rain.

The plants are 4 feet in height, and covered with flowers, and bolls. They appear somewhat tall and spindle shaped, each having from 6 to 10 branches.

10th. December. The plants continue to look well; bolls are forming, and will soon ripen.

Height of plant $5\frac{1}{2}$ feet, slightly shrubby and losing their lank appearance.

18th. January 1862. The pods are bursting their cells, and the cotton is in course of being gathered.

18th. February, the plants continue to flower and fruit. The produce has been collected which yielded 20 lbs of seed cotton, which when freed from seed returned 5 lbs clean cotton wool.

The expense of cultivating this plot of ground was as follows.

							Rs.	As.	Ps.
For digging manuring &c.	...	...	...	...	...	...	0	0	8
Weeding &c.	...	...	...	...	...	...	0	0	4
Seed.	...	...	...	...	...	...	0	0	1
Watering	...	...	...	...	...	...	0	0	8
Picking	...	...	...	...	...	...	0	0	1
Cleaning	...	...	...	...	...	...	0	0	4
Land rent	...	...	...	...	...	...	0	0	

Total 0 2 10

An acre of land similarly managed, will contain 8,066 plants; the average cost will be 16 Rs. 2 As. 3 Pie, and the produce of an acre at the foregoing estimate will be about

806½ lbs of clean cotton wool, which at the low rate of 6 pie per lb will yield 25 Rs. 3 annas 4 pie per acre, from which if we deduct Rs. 16-2-3 as the cost of culture, there will be a balance in favour of the ryot as clear profit 9 Rs., 1 anna, 1 pie.—With this as with the former variety, the profits will be larger in comparison to expense, according to the magnitude of the operation.

2. A single plant of this species being three years old, growing at the back of a dwelling house, and receiving neither manure, water or other care, yielded during 1861 18 oz of seed cotton, which when freed from seed, and clean picked, produced 4½ oz of clean cotton wool. The plant was about 6 feet in height, and rather shrubby, and continues without intermission to be productive throughout the whole year. The soil on which it grows is gravelly.

Allowing then one plant to every square yard, an acre will contain 4,840 plants, and taking not 4½ oz, but 1½ only, as the average of single plant, an acre will accordingly produce about 453¾ lbs of clean cotton wool, which taken at 400 lbs per acre will at the lowest rate, viz. 6 pie per lb, yield 12 Rs., 8 annas.

Here, it must be understood, the plant has had no culture; but with care, and moderate cultivation, the quality, and quantity will both increase; and as the plants are perennial, they will continue to fruit for several consecutive years, the produce increasing with the age of the plant.

3. A plant 8 years old, growing at the back of a native dwelling house, receiving no water, except that obtained from the people of the house in the course of their ordinary ablutions, no manure, or care of any kind, about 12 feet in height having upwards of 13 lateral branches; vigorous and healthy in appearance, and producing flowers and fruit for the greater part of the year.

The produce for the last year (1861) was 3 lbs, 10 oz of seed cotton, and this when freed of seed, yielded 1 lb, 6

oz of fine cotton wool, silky, rather short in the staple, and of a fine white colour.

The soil on which it grew was a sandy loam. Thus, taking an acre with 8 year old plants, allowing only 4,000 plants to an acre, and taking the produce at only 4 oz per plant instead of 1 lb 6 oz as above, the produce of one year will be 1,000 lbs of cotton per acre, which at 6 Pie per lb will return 31 Rupees 4 annas.

Judging then by the foregoing results, we may venture to predict the most favourable conclusions were a certain amount of careful culture, and attention extended to the plant. The quantity will not only increase but the quality will also improve.

I wish to draw particular attention to this hitherto totally neglected species of cotton plant. The results given above are all from actual experience. The natives of the district express their belief that the plant will thrive and fruit well for upwards of 20 years, with moderate culture, and occasional pruning &c. and I have no doubt of the result, should it only be given a fair trial by those interested in the cotton question.

B Foreign Species, Garden Culture.

Gossypium Accuminatum, or Brazil Cotton.

The plot of ground selected for this purpose was 96 square yards, 18 miles distant from the sea, and about 12 feet above sea level. The soil was chiefly composed of gravel and sand; the former predominating. The earth was thoroughly loosened and turned up freely, to the depth of one foot. It was then manured, at the rate of 3 tons per acre. The soil was levelled, the clods were crushed, and parallel trenches were formed each 4 feet apart, into which the seeds were put down in holes at a distance of 4 feet from each other, each hole receiving from 3 to 5 seeds.

These were put down on the 10th of May 1861; the seeds were of two kinds, some recently imported and others long ac-

climated in this district. On the 13th a few seeds sprouted up, and by the 20th they had all made their appearance. On the 21st. the seedlings were between four and five inches in height and the leaves were covered with dark dots, there being but 2 obovate leaves on each seedling. On the 24th they were $6\frac{1}{2}$ inches in height, and on the 26th a second pair of entire acuminate leaves were found, and on the 31st a third pair of leaves.

On the 3rd. of June a very light shower of rain fell. On the 5th each seedling was found to have thrown out from 4 to 5 leaves. On the 6th another light shower of rain fell, and on the 9th the seedlings were hand weeded and watered, and this was repeated on the 14th. On the 24th a heavy shower of rain fell, between 4 and 5 P. M., followed on the 28th by some light drizzling showers. The seedlings were advancing nicely.

The 5th pair of leaves were found slightly trilobed, and in all the succeeding ones the divisions were deeper. On the 30th, insects of the caterpillar kind were found infesting the plants. To destroy these the plants were dusted with quick lime early in the morning, before the moisture deposited on the leaves by the dew at night evaporated.

On the 15 July a slight drizzling shower fell, and on the 20th the soil around each plant was freely loosened and the weeds removed. On the 21st at $7\frac{1}{2}$ A. M. a heavy fall of rain. On the 22nd. the plants stood about 24 inches in height, and had begun to show lateral shoots, one in the axilla of each leaf. 2nd August, a fair shower of rain fell followed by another on the 3rd and some light drizzling rain on the 4th.

The plants are now about $2\frac{1}{2}$ feet in height. On the 8th, 9th, and 13th some smart showers. On the 23rd the soil was well loosened by a hand hoe, freely weeded and manured, and on two following evenings there was light drizzling rain. 26th, after the setting in of the North East wind, the plants looked sickly, the stipules first began to decay; this was soon followed by change of colour in the leaves, from a dark to a light

green. The margins contracted and the blade assumed a hollow or concave appearance. The contracted margins soon began to grow brown and the blade of the leaf became studded with yellow spots, and these in their turn became brown and fell through, leaving irregular and circular apertures in the leaves.

10th September. In some plants the entire blades were destroyed, leaving nothing but portions of the naked midribs of the leaves sticking out, giving to the plant a singular appearance. Nevertheless, a few plants were showing flowers, and those plants that received shelter from the adjoining hedge were looking perfectly healthy. The natives attribute this state of things to the " Evil eye."

22nd. A few light showers of rain fell since last report, and some of the plants which had slightly recovered themselves were forming flowers. *

1st. October 1861. A few of the plants continued to show flowers. The ground was freely weeded on this day.

1st. November. Most of the plants are in flower, and those that were sickly began to recover after the wind changed to the South. 6th and 7th, most of the plants were blown down and nearly uprooted; to prevent further injury their crowns were thinned out and the earth ridged up against the root stems to the height of one foot. Most of the flowers and young pods were blown away.

1st. December. The plants were now between 4 and 5 feet in height, and looked healthy after the wind changed to South.

1st. January 1862, The plants were looking remarkably healthy, and flowered freely; some of the early pods that escaped injury from the rains now began to ripen, and burst their capsules. The plants were irrigated twice during the month.

1st. February. The wool was in course of collection whilst the plants continued in flower. They were irrigated three times during the month.

1st. March. The wool was still being collected. Much of it is soiled by insects.

The plants were irrigated once a week. On the 1st of April the produce of plants was 10lb of seed cotton, this when cleared of the seed yielded $3\frac{1}{2}$ lbs. of lint, 1lb. of refuse, and $5\frac{1}{2}$ lbs. of seed.

The cost of cultivating this plot of ground was as follows.

For preparing soil,	...	...	...	...	0	4	0
Seed,	...	...	...	...	0	1	0
Watering,	...	...	...	...	0	8	6
Weeding	...	...	...	...	0	4	0
Picking,	...	...	...	...	0	0	6
Cleaning,	...	...	...	...	0	0	8
Land rent at 10 Rs. per acre,	...	...	...	...	1	0	8
Total,					2	3	4

As the plants still continue to produce it is impossible as yet to estimate the full value of their yield. But even taking it as above given, then that of an acre will amount to $176\frac{1}{2}$ lbs of clean cotton wool.

I was now desirous of determining the produce of the Brazil variety, according to the actual age, and, with this view, I took under my immediate supervision every plant in the place varying from 1 to 5 years of age; and the results are as follows.

1. The produce of a plant one year old was 1 to 2 ounces of lint per plant. Taking an acre at 1000 plants, and the produce of each plant at 10 oz. that of an acre will amount to $178\frac{1}{2}$ lbs of seed cotton, and allowing for seed and refuse will produce $62\frac{1}{2}$ lbs of clean wool.

2. The produce of a 2nd year's plant averages from $1\frac{1}{2}$ to 2 ounces. Take the first of these rates, and allow $1\frac{1}{2}$ oz to each plant. The produce of an acre, making abatement for seed, and refuse, will amount to $93\frac{3}{4}$ lbs of clean lint.

3. The produce of a third year's plant was from 2 to 3 oz; taking the lowest rate of produce per plant, the produce of an acre will amount to 125 lb of cotton wool.

4. The produce of a 4th year's plant was from $2\frac{1}{2}$ to 4 oz. Taking the produce per plant at $2\frac{1}{2}$ oz, the yield of an acre, deducting refuse and seed, will amount to $156\frac{1}{4}$ lbs.

5. The produce of a 5th year's plant was from 3 oz. to 4 oz. and taking it at 3 oz. per plant, an acre will yield, free of refuse and seed, $187\frac{1}{2}$ lbs. of clean wool.

These plants were cultivated in the usual way. The calculations are from actual experiments. In some instances carried out on a single plant, and in others from half a dozen or more. Of course, it will be necessary to make allowances for unfavourable seasons, unforeseen accidents, &c. In connection with the foregoing experiments, I, at the same time, planted, about the middle of each succeeding month, a few seeds of each of the varieties, and the results of these experiments satisfy me, that from September to November is the best time for putting down seeds in soils subject to the influence of the N. E. monsoon, and from analogy I should say that in localities subject to the influence of the S. W. monsoon, from May to July would be the best time for sowing.

In these, my last calculations, it will be seen that I have allowed for only 1,000 plants to each acre, whereas, an acre should, properly speaking, contain from 2 to 3,000 plants. But allowing for accidents and failures, I have considered 1,000 plants as the safest data to work upon.

Some plants will fruit abundantly others again yield scantily, so that I have restricted my calculations to 1,000 plants per acre, and in estimating the produce, I have taken up the lowest figure, so as to keep within safe bounds.

Field Culture.

To test the Brazil Cotton as a field culture, a piece of fallow land, of a sandy loam, measuring 20 square yards, was ploughed, weeded, and trenched.

On the 2nd. June 1861, seed which had been acclimated was sown three feet apart in parallel rows, most of which

germinated between the 5th and 9th days. Some did not appear till so late as the 25th of the month, whilst others had altogether lost their vitality, and those which had first sprung up were now nearly 4 inches high. All these were dependent wholly on the rains. In dibbling the seeds, several had been put into each hole ; but on the 1st. July the seedlings were thinned out, leaving but one in each. On the 12th fresh seeds were planted in the room of those which had failed. On the 3rd. August the young plants were thriving. On the 15th the soil was lightly loosened by the hand hoe and weeds removed. 22nd. Most of the plants began to assume a sickly appearance similar to those of the garden culture previously noticed, whilst a few were showing flowers. The soil was again slightly loosened, and weeds removed.

15th September,—Most of the plants still continued their sickly appearance though each plant displayed one or more flowers.

15th December. The plants were about 4 feet in height, shrubby, and improved in appearance.

15th February 1862,—The plants had improved very much, and were coming into bloom. 20th February, some of the early pods are ripened.

1st April—At present 5 lbs. of cotton had been gathered, and the plants are still in flower and fruit.

The cost of culture was as follows.

							Rs.	As.	Ps.
Ploughing	..	...	...	...	...	...	0	1	8
Seed,	...	...	...	..	...	...	0	0	2
Weeding,	...	...	...	...	...	...	0	0	4
Picking,	...	...	...	...	...	...	0	0	2
Cleaning,	...	...	...	...	...	...	0	0	3
Land rent 2 Rs. the acre,	...	...	...	...	...	...	0	3	1

Total, 0 5 8

*Garden Culture.**Gossypium Barbadense.*

1st. Variety—Bourbon Cotton. These seeds were once acclimated at Bangalore, and have been reproduced in this district for the last seven years. A plot of garden land consisting of 18 square yards, the soil a sandy loam, was freely turned up by the mahamety, all weeds removed, clods crushed, levelled and drawn out into parallel trenches 3 feet apart, and from 3 to 5 seeds were planted in each on the 30th May 1861, at a distance of 3 feet from each other.

3rd June, the land was irrigated—8th, most of the seedlings had come up, and were about one inch in height, having but the two seed lobes. 9th weeded. 10th watered; most of the seedlings were out. 22nd—The earth was loosened, and weeds extirpated. The seedlings were looking well, were between 4 and 6 inches in height, and were much refreshed by a fall of rain on the previous evening. The lower part of the stems and the inner part of petioles are tinged red. 28th, a light shower of rain. 30th—The plants were lightly dusted with quick lime to keep off insects.

8th July. The plants are throwing out lateral shoots. 22nd. height of plants from 12 to 15 inches, and branching freely, the earth loosened with a hand hoe and weeds removed.

30th. The plants were looking well and a few were forming buds. 4th. August, two days rain. The plants are progressing; height from 15 to 20 inches. 14th. The branches were found to outspread much. 17th—The soil was loosened, and weeded with hand hoe.

19th. Rain. The whole of the early blossoms were blown away. 22nd September. The plants were going on well bushy below, and tapering upwards, and were again beginning to bloom.

October 5th. The soil loosened and freely weeded. The plants were now from 4 to 5 feet high, and covered with blossoms, and young pods. Insects were troublesome, conse-

quently the plantation was smoked in the manner detailed in another part of this Essay.

November 5th—A few of the earlier pods have ripened and burst their cells.

December 5th, cotton was being gathered in small quantities and the plants irrigated. January, 1862. The gathering of cotton in small quantities was still continued. The plants were watered once a week.

1st April. The produce up to this time was 10 lbs. 8 oz. of seed cotton, which when picked yielded 3 lb 8 oz. of cotton wool, 1 lb. 8 oz. of refuso, and 6 lbs. of seed.

The cost of culture was as follows :—

	Rs. As. Ps.		
For preparing soil,	0	4	0
Seed,	0	0	6
Watering,	0	3	0
Weeding,	0	1	0
Picking,	0	0	3
Cleaning,	0	0	6
Land rent,	0	0	6
Total,	0	9	9

The plants are still bearing fruit, but taking the produce of an acre as above, the result will be upwards of 800 lbs. of clean cotton wool.

1. The produce of a first year's plant was from 1½ to 3 oz. per plant, but taking the acre at 1,000 plants and the produce at 1½ oz. per plant, that of an acre will amount to upwards of 300 lbs. of seed cotton, which allowing for seed and refuse will produce upwards of 93 lbs. 12 oz. of clean wool.

2. The produce of a third year's plant was from 2 to 6 oz. of cotton; taking the produce of plant at 2 oz. an acre will yield 136 lbs. of cotton wool.

Field Culture.

This cotton was tried as a field Culture, for which purpose a spot of ground consisting of 277 square yards was freely ploughed up, weeds removed, and on the 10th June 1861, seeds were sown in parallel lines, 4 feet apart, each plant 3 feet distant from the other. Each hole received from 3 to 5 seeds. The soil was a sandy loam containing some gravel. In July the seedlings had come up without many failures. In August they were thriving, and in weeding were thinned out.

In September, a few plants began to show flower. They were weeded.

In December, the plants were flowering freely and a few of the earlier bolls were bursting their cells, and the plants were $3\frac{1}{2}$ feet in height and looking very bushy. In January commenced gathering the cotton, and as the plants were still in fruit the cotton continued to be gathered as the bolls opened.

April, up to this time 14 lbs. of cotton wool has been gathered.

The Cost of Culture was as follows :

								Rs.	As.	Ps.
Ploughing,	..	..	..	..	..	..	..	2	0	0
Seed,	..	..	..	..	..	..	..	0	4	0
Weeding,	..	..	..	..	..	..	..	0	8	0
Picking,	..	..	..	..	..	..	..	0	2	0
Cleaning,	..	..	..	..	..	..	..	0	2	0
Land Rent,	..	..	..	..	..	..	..	0	8	0
								<hr/>		
Total,								3	8	0

Variety 2, New Orleans Cotton. In the same locality a a plot of ground measuring 27 square yards, was prepared in the same way as that for the other varieties and the seeds were some recently imported by Messrs. Linc and Co. of Madras, and were put down on the 6th of June 1861. On the 18th they were irrigated. On the 25th about one half of the

seeds had germinated. On the 28th they were between 2 and 3 inches in height and looking very well; a few seeds were only now pushing through the soil. 29th, fresh seeds were put down where it had failed previously.

Some showers of rain fell during the week ending 8th July. On the 16th and 22nd it rained again and the plants, in general, were not looking so healthy. Those that shewed themselves first were now between 3 and 6 inches in height. All were lightly dressed with the usual manure (wood ashes, and dung heap rubbish) and watered. 1st August, most of the plants were showing flower buds, and some few blossomed. The plants were only about 8 inches in height and were throwing out side shoots, although they were still looking delicate with the leaves curled up.

12th. The plants were now between 12 and 15 inches in height, and still looking sickly. 14th, they benefitted from rain and were improved in appearance, and almost all were in flower. On the 16th and 17th the soil was loosened with a hand hoe, and the weeds removed, plants looking well; the bolls were large and fine. 19th light rain. 22nd. Dressed with manure; about 4 oz. was put around each plant. 28th. The entire piece of ground dressed with manure, and weeds removed. Some drizzling rain fell, which threw down the flowers, and immature pods.

9th. September, 4 pods that had burst their cells were taken off; irrigated plants. 22nd. Some plants were thrown down by rain, and most of the pods had rotted, these had their stems earthed up.

1st. October, weeded, and watered. 1st. November, watered three times during the month. The pods were picked off as they ripened.

December. Bolls continued to ripen. Insects were very destructive. The plants were irrigated once a week. January, Cotton continued to be gathered; plants were watered once a week.

February. Plants were watered once a week; they look withered; most of the leaves are dry; nevertheless they continue to shew flowers.

15th March, up to this time 24 lbs. of seed cotton had been collected whilst the plants continued to be in bearing.

The cost of culture was as follows,

							Rs.	As.	Ps.
For preparing soil,	...	...	...	...	...	...	0	1	0
Seed,	...	...	...	...	...	...	0	1	0
Watering,	...	...	...	...	...	...	0	0	2
Weeding,	...	...	...	...	...	...	0	0	2
Picking,	...	...	...	...	...	...	0	0	1
Cleaning,	...	...	...	...	...	...	0	0	2
Land rent,	...	...	...	...	...	...	0	1	6
Total,							0	4	1

Field Culture.

At the same place and in the same soil, as the other varieties were cultivated, 162 square yards of ground was prepared in the same way, and seeds put down on the 16th of August 1861. Beyond that of exterminating weeds no other care was given; about the middle of September a few plants began to show flower, and by the end of that month, a few bolls had ripened and they then continued to produce, and up to 1st April 30 lbs of cotton had been collected; and although most of the plants were looking dry and withered they still continued to be productive.

Cost of culture of the above plot.

							Rs.	As.	Ps.
For preparing soil,	...	...	...	...	...	...	0	6	0
Seed,	...	...	...	...	...	...	0	1	0
Weeding,	...	...	...	...	...	...	0	1	0
Picking,	...	...	...	...	...	...	0	1	0
Cleaning,	...	...	...	...	...	...	0	1	0
Land rent,	...	...	...	...	...	...	2	0	0
Total,							2	10	0

It will be observed that though the early sowing was attended by successful results, I have notwithstanding advocated late sowing. I have already detailed the experiments of May, and June. But I must in explanation add that I continued to plant seeds about the middle of every month, up to the month of February 1862 inclusive, and taking all things into consideration, it is my firm belief that from September to November is the best time for planting in land subject to the influence of the N. E. monsoon, and that from May to June for localities subject to the S. W. monsoon. For the success, however, of those experiments, I was indebted to two favourable incidents.

First,—The season was irregular, and rain fell only in small quantities, from June to October, which enabled the plants fully to establish themselves, by the aid of partial irrigation, in the garden culture ; but without that aid in the field culture.

Secondly,—The rains of the N. E. monsoon, which set in early in November lasted for only a week, consequently the plants were enabled to advance rapidly and favourably. Had the N. E. monsoon been heavy, as is usually the case, and continued, as it generally does, to the end of December and sometimes till January, then the experiment would doubtless have failed, either from the plants having been injured by the heavy rain, or by the destruction of a large portion of the flowers and pods, as well as by the serious deterioration of the product.

C. Observations on both.

The cultivation of cotton first attracted my attention in the year 1851 and 1852, in the ceded, or Bollary, district of the Madras Presidency, but I did not give the subject close attention till 1855. In the years 1855-56 and 57 I traversed the length and breadth of the cotton districts of Orissa, Nagpore, and parts of Behar. In a report written in 1856, I

casually alluded to the extensive culture of cotton in Orissa, and the large return in produce of fine staple cotton with the great amount exported from these parts, as well as the quantity consumed in the localities themselves.

At the time I collected extensive information not only about cotton, but on other produce of these provinces, with an object which I had then in view, but which circumstances unfortunately prevented me from carrying into effect at the time. However, much of the information I then obtained on the subject of indigenous cotton I have now embodied in this Essay.

With reference to exotic or foreign cotton, my attention was drawn to the subject in June 1857, and as my mind was stored with information regarding the culture of indigenous cotton, I felt no difficulty in giving to the foreign species the attention they deserved; more especially as I had terminated my travels, and settled down in a station where I had every opportunity of giving scope to my wishes in this and other matters. My notice was first attracted to the subject of Brazil cotton by the gentleman who showed me a few plants raised from seed procured direct from Cairo.

When I saw these plants they were between three and four months old, and were about 3 feet in height, having an inclination to become shrubby. Not long after this my attention was directed to the acclimated Brazil cotton, which was, I may say, naturalized in the district, where it has been in cultivation upwards of half a Century. On close examination, and comparison of the living plants, I found it to be the same as that cultivated by the gentleman above alluded to, from seeds which were imported from Cairo: the only difference being, that one was raised from recently imported seeds, and the other naturalized in the district.

Gossypium Accuminatum, or Brazil Cotton.

1. This cotton has been grown by natives in betel gardens for upwards of 60 years, but it is made subservient to the cul-

ture of the betel vine, and which it is intended to support for training the vine. The seeds are planted with other trees close together and somewhat crowded. The plant does not fruit before the second year, and continues to do so for about two years. The garden is then abandoned and the cotton and other trees uprooted.

This cultivation is carried out on wet lands, where the soil is a deep sandy loam. It participates in the culture given to the betel, which is manured with cow-dung and wood-ashes twice a year, and irrigated every second day.

The plants with the betel are grown on ridges 3 feet wide, and on either side of the ridge on which they are planted the water trenches are 3 feet deep and two feet wide, which always contains at least the depth of a foot of water, except in very dry weather.

The water is taken up by shallow, oval, wooden dishes from the trenches, and thrown on the vine bearing ridges. In dry weather water from adjoining wells is conveyed to the trenches and from thence to the ridges.

The cotton plant being completely shaded by the others closely surrounding it, does not grow much during the first year: but in the second, when the quick growing trees on the ridges are arched and tied intermediately over the trenches, the cotton plant receives a larger amount of light and air, and shoots straight up to 15 or 20 feet in height, free of branches, until it outtops the others, and then throws out a few branches, and begins to fruit.

The betel gardener now lops off most of the branches, for fear it should become top heavy and be blown down by a gale of wind.

The one or two remaining branches now freely produce flowers, and fruit; the pods are large, completely formed, and contain from three to four cells. The wool is of a fine white color, has a good staple, and is free from harshness; although not silky, soft. When the plants are not much multiplied,

they yield about one pound of seed cotton per plant per annum ; this when ginned, and cleaned produces from $5\frac{1}{2}$ to 6 ounces of clean cotton wool.

The Average contents of an ordinary pod, were 20 grains of wool and 40 of seed.

2. The plants produced from the seeds that were procured direct from Cairo, and cultivated by the gentleman previously alluded to, began to show flowers in the sixth, and to ripen their fruit in the seventh and eighth months.

The soil on which they were grown was chiefly rocky, and composed of decaying granite. They were occasionally watered, but received no manure or other care.

When these plants were $2\frac{1}{2}$ years old, the produce was submitted to the local Agricultural Exhibition held at Chingleputt in February 1859, and a prize of 100 Rupees was awarded for the specimen.

The Remarks of the Committee on the exhibition were as follows : " This cotton was described as Egyptian, and bearing crops for 5, or 6 years, while it stood the heat very well."

I frequently examined these plants ; they were shrubby, well grown, and had from 12 to 15 lateral branches, and were about 4 feet in height. At an average there were from 150 to 200 hundred pods on each plant, and the capsule contained 20 grains of wool free from seed. A 1st. class medal was awarded to this gentleman at the Madras Exhibition of raw products for the same cotton.

3. Seeds, once acclimated, were sown in a small garden adjoining the above, belonging to the road department ; the soil is high dry and gravelly. The plants were occasionally watered but received no manure or other care. In April 1861, I found 6 plants growing here, they were about $3\frac{1}{2}$ years old and were $4\frac{1}{2}$ feet in height, shrubby, and having many branches. The stem at the ground gave a circumference of 2 inches. In some the branching took place immediately above the root, and in others 6 inches above it. I

counted the empty capsules on two of these trees, and found 150 on one and 170 on the other.

The officer in charge of the place kindly handed over to me the produce of the season of the 6 plants, which was 3 lbs, 6 oz, of seed cotton; this when picked clean and freed from seed yielded 18 ounces of lint or cotton wool.

Four of the 6 plants were the chief producers, the other two were injured by cattle and produced but a few pods.

The average weight of the contents of a pod were the same, 20 grains of wool and 40 seed.

On the 1st June 1861 I had these plants cut down to within a foot of the ground. The first shower of rain brought out numerous shoots, the plants became extremely vigorous, and are now about $4\frac{1}{2}$ feet in height. The earth around their roots was dug up and some refuse straw and grass were buried around each plant to form manure, and they were occasionally watered. They began to flower early in September, and the cotton began to be collected in December. The produce from 4 of these plants, in March 1862, was four pounds of seed cotton, which after being ginned yielded 1 lb, 12 oz of wool, and 2 lbs 4 oz of seed. The plants are still producing fruit.

4. A native procured a few seeds from the last mentioned place, and planted them in a piece of ground adjoining that belonging to the road department. This land is part of a garden where the soil is high, dry, and gravelly.

The seeds were put down about 3 years ago which may be said to be the age of the plants. Here I found, in May 1861, as many as 50 plants growing wild, and the place overrun with spear grass, and weeds.

They received no water, manure, or any other care. The plants appeared stunted, were about three feet in height, having each only three or four thin branches, and a few scattered leaves. The produce was never gathered, but I found on some of them from 30 to 60 empty capsules; the cotton from a few pods I found gave an average of 16 grains to each, with

40 of seed. The wool was white, the staple very ordinary and fibrous to the touch and appearing crispy.

5. In the garden of an officer here, there are two plants which were raised from acclimated seed in 1857, these are now about 5 years old and were grown on a garden soil. The plants have grown out luxuriantly and were in April 1861, $9\frac{1}{2}$ feet in height. Circumference of stem at the ground $7\frac{3}{4}$ of an inch and at the height of 14 inches, it branched into 3 divisions; a little higher up it gave off 25 or 30 smaller divisions or branches. At this time I collected off these plants one pound of seed cotton, which was only a part of the crop, the gardener having made away with the rest. This pound of seed cotton, when ginned, yielded 5 oz. of clean cotton wool of a beautiful white colour and good staple, soft, and free from all harshness. No particular attention was given to these plants, but as they were grown in the vicinity of some vegetable beds, they came in for an occasional share of water, but no manure or other care was bestowed on them.

These plants were cut to $9\frac{1}{2}$ inches above the ground in June 1861; in a very short time after numerous shoots began to appear. One of them was greatly sheltered in a corner, and the shoots were entirely eaten up by caterpillars; it did not thrive but continues with only two small branches. The other threw out about 30 shoots and became quite luxuriant; it is now about $4\frac{1}{2}$ feet in height and the produce this season, from this single plant, was 1 lb of cotton, which when ginned gave 6 ounces of wool and 10 of seed, but the plant still continues to fruit.

6. The late Collector of the district, J. Shubrick Esq., procured Brazil cotton seed from Chingleputt which he planted in January 1859 at Roshim Bag in Sydapet near the banks of the river, where there are at present nearly 200 plants. Each plant is 9 feet apart, the ground being about 8 chains. In 1860 they produced 15 pounds of cotton wool for the year. The plants were, I believe, watered, at first twice a week;

subsequently once a week, and lastly once in 10 days. But during 1861 they received no water, or other care.

The place was wild, overrun with couch and spear grass, and they were cut down in a very careless manner. When visited by me on the 17th September 1861, I found that from the careless manner in which cutting had been practised, the stems were injured, and some of the wool slit up. The consequence was that a few of the plants were dead, and the others had thrown out short shoots, but these were sickly, and the plantation was nothing more than a copse.

I again visited the garden on the 11th of December, the plants were still looking sickly, though some had a few flowers.

7. In 1859, the late civil and Session's Judge planted about an acre of land, with the Brazil Cotton, but unfortunately he selected his ground immediately under the bund of a large tank, and put down the seeds at a wrong time; so that they began to ripen their pods, about the time the rains commenced (in October) and much of the Cotton was not only injured but a large portion completely lost. Directly the Tank filled, the plantation was swamped, from the water in the tank oozing through and under the bund, so that whilst the tank continued to be thus filled the plantation remained a swamp; the effect of this was that the plants degenerated into soft wood and succulent foliage and they attained a great size, becoming more like trees than shrubs: although some of them flowered pretty well, these did not all produce fruit, and the fruit which did form did not ripen, but fell off in an immature state, so that on the whole the crop of Cotton gathered was between 30 and 40 lbs: the experiment proved a failure, but I have no doubt had the plants been cut down during the dry weather a fair crop might have gathered. Unfortunately I was out of the country at the time, and the gentleman on leaving the place, returned the land to the

* I am indebted to V. Vurdacharlos Esqre, Sheristadar, for this information.

native from whom he had farmed it for 5 years : as soon as the natives took charge of the land, every cotton plant was extirpated and used as firewood. On my return therefore I found not a vestige of the cotton plant remaining.

8. On the 18th September I visited the People's Park Madras, where there are about 100 Brazil cotton plants, which were found growing wild, choked up with couch and other grass. The plants were small and sickly looking, the largest was not above 3 feet in height ; most of the leaves were decayed, nevertheless a few have flowers, and are likely to have benefited from the rains that were then impending. 11th December, visited Peoples's Park and examined the whole of the Brazil plants. Excepting a few next to the superintendent's quarters, they have not grown at all ; since my last inspection, they have dropped the few flowers they had, and the plants are looking sick and withered, and the soil is overrun with rank grass &c.

Some of the Bourbon plants on the western side are looking tolerably well, and are in flower and fruit. Here also the soil is overrun with grass, and the plants, in general, are not very healthy ; they require to be kept free at least of weeds, even if no other culture be given them.

9. Visited the Horticultural gardens at Madras on the 18th. September 1861, examined 100 plants of the Brazil cotton nicely grown. These plants were forming blossoms, have attained nearly 6 feet in height, and the stems were 6 or 8 inches in circumference. They appeared to have formed much wood and leaves, as they were then only 6 months old. Said to have been cultivated since April last.

The plants appear to have received ordinary care.

11th. December, The plants appear to have run into wood and sap ; they are upwards of 8 feet in height, and are not quite so healthy in appearance ; have a few flowers and pods on each, but nothing commensurate to their size.

10. I visited a village on the coast 19 miles distant from

this, on the 23rd. February 1862 : here I found, growing uncultivated in a garden hedge, 3 Brazil cotton plants ; they were about 200 yards distant from the beach, and from the account of the owner of the garden, 2 were about 5, and the third about 3 years old. These plants were covered with flower and fruit. They stood nearly 7 feet in height, and the stems, at the ground level of the 2 older ones, were in the one 9, and in the other $8\frac{3}{4}$ inches in circumference. They had branched freely, and the cotton I then collected from them was $1\frac{1}{2}$ oz of clean cotton wool, which was soft, free from harshness, and of a white colour ; but nearly one half was soiled by insects, as I took off several larvæ from the pods. The gardener told me that each plant yielded about $1\frac{1}{2}$ lb of seed cotton, which, taking at an average, the produce of each plant would have been about 8 oz of clean cotton wool per annum.

Gossypium Barbaulense. Variety, Bourbon cotton. Some acclimated seeds were brought from Bangalore in 1856 by a Mr. Haydon and planted at a village about 30 miles from this. The plants were intended to form a hedge on either side of a walk in his garden. In 1856 he submitted some of the produce of these plants at the local Agricultural Exhibition, held at Chingleputt in that year, for which he received a prize of 50 Rupees. The Committee of the Exhibition report as follows. The specimen of American Cotton, (Bourbon) very fair, and though the quantity sent was small, being the produce of only a few plants, yet the Committee consider that a reward would show that a value was attached to the article and might conduce to a further introduction of it in the district." Thus encouraged, Mr. Haydon put down and raised about 100 plants at the same place.

Following his example, Mr. Wakefield of the road department planted 100 trees in a garden adjoining the above. Some time after this Mr. H. was obliged, in consequence of the failure of his health, to leave the place. He left this garden to the care of a native, who not only unceremoniously cut down

the cotton plants for firewood, but allowed free ingress to cattle, which devoured those that had escaped the axe. The plan of sowing adopted by Mr. H. was that of sowing in furrows, the plants being about 6 inches apart from each other. They were watered, whilst plantlings, for about three months; after that time they received no care whatever. They thrived well, and from his account used to flower and fruit throughout the year, and the average produce of cotton wool was said to be 3 oz, per plant. I visited this place in June 1861 to examine some plants which were said to be still there. I found a few of them alive, and these were flowering and bearing. There were also a great number of the stumpy remains of those that were cut down. But in the garden adjoining, belonging to the road department, about 150 plants were planted around a "parterre" as a hedge, and were in a fair state of preservation. I counted, on most of them from 70 to 100 pods; these were very small, but the staple of the wool, although soft and silky, appeared to be weak. The wool of a single pod averaged from 8 to 10 grains, and the seed 25 to 30 grains.

A single plant attracted my attention; it was growing close to a bed of greens and appeared to have been blown down; and as it laid on the ground it covered a space of about 5 feet in diameter. The girth of the stem on the ground was 9 inches. It was covered with flowers and young pods to the extent I should think of 500 and more. From this it was evident that the cotton plant benefitted by the water given to the bed of greens, and this accounts for its flourishing condition. The cotton from most of these plants was not collected, and even the little gathered was carelessly thrown in a corner where it was partly eaten up by white ants, and rats. I found young plants growing all about the place, some upwards of a 100 yards distant; these were evidently blown over there from the parent plant, and the seeds grew spontaneously without any care. The soil all about here is of strong binding gravel,

very hard to turn up. Mr. Haydon stated that during his time the native weavers about the place readily purchased the cotton from him at 4 As. per pound.

Gossypium Barbadosense. Variety, New Orleans Cotton. In June 1861 I supplied the Revd. Mr. Ranahoojum at Wallajahbad with a small quantity of the above named seed recently imported by Messrs. Line & Co. of Madras, which that gentleman put down in his garden among some country vegetables. The seeds sprung up and fruited freely. When I visited the place in December 1861, I found some half dozen plants about $2\frac{1}{2}$ feet in height, thriving well and loaded with fruit; the pods were unusually large, and the seed well covered with wool; sometime after Mr. Ranahoojum sent me a part of the produce which was one pound of seed cotton, although the plants had not then ceased to fruit. The cotton wool when freed from seed amounted to $6\frac{1}{2}$ oz and the seed to $9\frac{1}{2}$ oz.

In July 1861, I sent to Major Mitchell, who was temporarily residing at Sadras in the Chingleput District, a few seeds of each of the New Orleans, Brazil, Bourbon and Country cotton, which he planted in a garden near the beach. The Country Cotton seeds grew up on the 4th day, and those of the varieties between the 8th. and 10th. days. They continued to be very healthy and vigorous for the first six weeks, when from the continued heat of the weather and the absence of rain they appeared to stop in their growth. But the fall of rain revived them, and they sprung up quickly to the height of some two feet, when they were again checked by some goats having trespassed into the garden. One of the New Orleans plants was but slightly injured, and from this plant the Major shewed me, on my having visited Sadras in February 1862, about 8 oz of seed cotton, which, though a pretty fair sample, was not so fine, nor so long in the staple as that produced at Chingleputt. He has since however obtained a few larger bolls of a finer sample. The other varieties were much more vigorous but had not yet produced.

The soil was little better than bare sand, and the plants had the disadvantage of no manure and a scanty supply of water. There seems however evidence sufficient to prove that the Exotic plant will thrive even at Sadras with care and attention, and that the New Orleans is the earliest variety.

VI. THE COLLECTION AND PRESERVATION OF THE COTTON WOOL &c.

The fibres of the cotton wool come under the same category as woody fibres, and are found surrounding the seed; and although the resisting power of the cotton fibre is much below that of other fibres, yet its great usefulness has rendered it an important article of commerce.

It will be necessary before entering at once on this part of the subject of the Essay, to consider briefly the Physiological uses of the wool to the plant itself; as well as into its microscopical and chemical structure.

The physiology of the wool is at present ill understood, but, as far as we can learn from experiments, the wool seems to perform no important function until the fruit has ripened and burst its capsules by the separation of its valves, when the wool then becomes at once exposed to the rays of the sun, which absorbs its moisture. So that the wool, which up to this time had closely encased the seed, is loosened by degrees, and by the time the seed itself is completely dry, it, with its attached wool, is separated, and being rendered light and buoyant by its downy spreading envelope, is carried by the wind to some distance from its parent plant, and as I have seen it sometimes, to the distance of a hundred yards or more, when unobstructed by trees &c. The analogue of this exists in the tribes of the Sterculaceæ and Asclepiadaceæ, but more particularly in the latter, and better illustrates the peculiarity from the seeds being smaller, flatter, and lighter. I have watched these feathered seeds, carried out of sight as they floated along in the air, like miniature balloons, desecring one of the innumerable

instances of the power and wisdom of the Creator, in dispersing and covering the land with fruitfulness.

Structure of the Cotton Wool.

On examining a Cotton pod soon after the ovary has been impregnated (which is known by the change in colour and the fading of the petals, or flower leaves, or corolla) it is found to contain a number of seeds according to its particular variety. If a single seed be separated and examined by the naked eye nothing is visible; but when seen through the microscope, it is found covered with a villous coat, formed apparently of elongated cells joined end to end. These are filled with sap. The young seed itself is somewhat pear shaped, and resembles, in miniature, some of the China candied fruits with the frosted crystals of sugar covering it. On letting out the contents of a single cell, it is found to consist of granular cells, containing a centro-lateral nucleus. On examining a pod between 3 and 4 weeks old, the seed still retains somewhat of its pyriform shape and appears quite shaggy. The fibres, tapering to a point at their free end, resemble hollow cylindrical tubes filled with fluid, and vary in length; and on submitting a single fibre, compressed between pieces of glass, to the microscope, the flattened surfaces become distinctly visible. Again, on substituting a mature fibre before it gets dried, the filament is found to consist of tubular hairs, which are now quite cylindrical. After the dehiscence of the mature capsule, by the contraction and separation of its valves, the wool becomes dry from exposure. A filament now placed under the microscope is found to resemble a flattened piece of tape twisted upon itself, and apparently formed of an extremely thin and transparent membrane, interspersed with dark granular matter, which, after a certain time, disappears in some of the varieties.

Composition of Cotton. The wool of the cotton is but a slight modification of woody fibre, and is composed of Carbon, Hydrogen and Oxygen; their exact proportions have not been

ascertained, but in all its essential chemical properties it agrees with ordinary woody fibre. The filaments when of superior quality are of a fine texture and silky softness.

If of inferior quality, the texture is harsh and feels somewhat crisp.

Chemical Characteristics.

The specific gravity of cotton wool is 1.188,—the wool is tasteless, and destitute of smell. The fibre is insoluble in water, Alcohol, æther, fixed and volatile oils, and vegetable acids: dilute Alkaline leys have no perceptible action on cotton, but when very strong, and assisted by a sufficient degree of heat, they dissolve it. In combination with Nitric and Sulphuric Acids, it forms the explosive material known as “gun cotton” which is employed in the manufacture of Collodion. Cotton has a strong affinity for some of the earths, especially Alumina. Hence this substance is used as a mordant to fix colours on cotton. Iron stains cotton a yellow colour, and the stain, unless recent, cannot be removed by Alkalies or soap. Oxide of tin also combines with cotton; consequently it is frequently used as a mordant.

Cotton wool readily unites with Tannic acid and forms a yellow or brown compound. Nitric acid, when assisted by heat, decomposes cotton wool, forming Oxalic acid. Sulphuric acid chars it; Chlorine gas bleaches it, and probably alters and dissolves it when applied in a concentrated state. Cotton wool is extremely combustible and burns with a clear, lively flame. When distilled it yields a small quantity of oil but no Ammonia.

Composition of the Cotton plant.

On the 16th June 1861, with the view of ascertaining the composition of a cotton plant, a five year old plant of the

Brazil variety, was selected for experiment. It was grown in a garden soil but had received no particular culture, the height of the plant was 9 feet $2\frac{1}{2}$ inches. It was cut $9\frac{1}{2}$ inches above the soil, girth of stem $7\frac{3}{4}$ inches. The stem divided into 3 branches at the height of 2 feet from the ground. Circumference of each division of the plant 6 inches.

Weight of the plant.	..	...	..	lbs.	oz.
Woody part of the stem.	..	..	..	9	$8\frac{1}{2}$
Twigs, leaves, flowers and pods.	...	...	...	7	$6\frac{1}{2}$

Total, 16 $15\frac{1}{2}$

The plant was cut up after this, and the leaves twigs &c. were enclosed in a calico bag, and the wood tied into a bundle and dried in the sun thoroughly, and on the 30th July 1861 again weighed, when their weight was found to be.

				lbs.	oz.
Woody parts of stem.	..	...	..	4	8
Twigs, leaves, flowers, and pods	..	..	..	3	1

Total, 7 9

The dried wood, leaves &c. were now placed in a new clean earthen pot and thoroughly incinerated on the same day, and the ash that remained weighed 8 Ounces.

Percentage of composition of plant.	..	...	..	lbs.	oz.
Water,	..	..	..	9	$6\frac{1}{2}$
Organic matter,	...	..	..	7	1
Ash...	..	..	..	..	8

Total, 16 $15\frac{1}{2}$

Specific gravity of the ash at a temperature of 80° was 4.242. Not having the necessary Chemical apparatus &c. I engaged the services of J. Mayer Esq. Professor of Chemistry at the Medical College Madras, to conduct the analysis of the cotton plants, whose report I append to this Essay.

Another experiment was made with the following plants which I have here tabulated.

Variety of Cotton.	Date of Experiment.	Age of plants.		Branches	Length of roots.	Girth of stem at base.	Weight of green plant.	When re-weighed.	Weight of dried plant.	Weight of ash.	REMARKS.
		Months	Inches	No.	Inches.	Inches.	Oz	Months	Oz.	Oz.	
1. Brazil, ..	28th Decr. 1861	8	66	8	42	3 $\frac{3}{4}$	54	4th Feby. 61	19	1 $\frac{1}{2}$	
2. Bourbon, ..	Ditto	8	84	25	54	3	58	5th Ditto	21	1	
3. New Orleans,	29th Ditto. 1861	6 $\frac{1}{2}$	51	20	30	2 $\frac{1}{2}$	19	6th Ditto	5 $\frac{1}{2}$	$\frac{3}{4}$	
4. Indian, ..	2nd Feby. 1862	9	84	8	42	3	48	27th Ditto	20	6 $\frac{1}{2}$	
5. Religious ..	9th Ditto. 1862	8	96	12	36	3 $\frac{1}{4}$	30	27th Ditto	14	2	

These plants were in flower and fruit when taken up, and were grown in a gravelly soil.

The experiment was carefully conducted in the manner detailed above.

Percentage of Composition of Plants.

Variety of Cotton plants.	Water.		Organic Matter.		Ash.		Total.		REMARKS
	lbs.	Oz.	lbs.	Oz.	lbs.	Oz.	lbs.	Oz.	
1. Brazil,	2	3	1	1½	0	1½	3	6	The ash of these plants were placed in glass-stoppered bottles and sent to Professor Mayer for analysis.
2. Bourbon,	2	5	1	4	0	1	3	10	
3. New Orleans, ..	0	13½	0	5	0	¾	1	3	
4. Indian,	1	12	0	13½	0	6½	3	0	
5. Religions, ..	1	0	0	12	0	2	1	14	

Collection of the Cotton Wool.

Some care is necessary in passing between the different rows of plants when the cotton is being collected. As soon as the fruit begins to ripen and burst, and exposing the cotton in its cells, a few women should be engaged to gather it, and from three to five acres is a fair days work for one woman. The cotton should be picked, either by drawing out the woolly seed from the open capsules with the thumb and fore finger, and it readily separates from each cell, or by cutting the capsule off the plant, and leaving the extraction of the wool to be performed subsequently.

In extracting the wool from the capsule, the soiled cotton can at once be separated, and it will perhaps save trouble subsequently and prevent the necessity of going over the wool again; but by the former mode of gathering, empty husks or capsules are left on the plant, the result of which is that the twigs generally die away with the husk, and by

its remaining so prevent the plant from forming other flower buds. This is of course a great disadvantage. On the other hand, the capsules are cut away with a good pruning knife at the time the pods are collected, and the plant is left unincumbered, whilst at the same time by this moderate pruning, if I may so term it, the plant is much benefitted. New flower shoots begin to push, close to the extremities which have thus been cut off. When the cotton has been brought into the house the wool can be drawn from the capsules, removing the soiled from the clean portion; and if, at the same time, the wool be opened out, it will favour its drying and render easy the subsequent operation of ginning, or using the Churka, to separate the wool from the seed.

Whilst the wool is being loosened out it will not take much time to rid it of any extraneous matter. I have found that a woman will extract the wool from the cut capsules, separate that which is soiled, loosen the wool generally, and free it of foreign matter, at the rate of nearly 100 pounds of seed cotton in a day of 10 hours; and I have also found the plan of cutting the pods off the plant the best. A few trained women should alone enter the plantation for this purpose, and made strictly aware that they are to use every caution whilst working, and that the plants on either side be not wantonly injured as they pass onward; and that those which have become interwoven are to be carefully disentangled to enable them to pass by without any injury to the plant.

Each woman should have bags made of some coarse cloth, or what is better a wide basket carried on the head of another, into which the pods should be thrown as they are taken off, and as the basket becomes full, it should be emptied into the storehouse, or other suitable place.

Should the plan of removing the cotton from the cells of the pod be adopted, bags made of cloth would be the best. Each woman should have two bags, one slung on each shoulder; the one to receive the clean, and the other the soiled cotton.

As soon as the capsules begin to burst arrangements should be made for collection. The best time to do so would be the afternoon, the later the better. About the same hour every day, parties should be sent into the plantation to bring away all the open pods; if this be not done, the heavy dews at night are likely to injure and soil the wool; and especially when there are indications of rain this should never be neglected for a single day, as the dry wool is apt to absorb moisture, and is thus not only likely to become soiled, but also weakened from tendency to disorganization of the fibre.

As soon as the pods are brought into the storehouse, which should be a large clean and airy building, they should be spread out, and either then, or when less work is on hand, a few children should be engaged to separate the wool from the capsules, in doing which, clean should be separated from the soiled. The wool must be well opened out from the seed, and any foreign matter that may be present should be removed, and the cotton, thus cleaned, set loosely aside on a loft, which should be erected all round the inner part of the house. The empty shells should be thrown into the dung pit to form manure.

Should the plan of only extracting the wool from the capsules on the plant be adopted; whilst the operation of separating the clean from the soiled wool is being practised the wool on each seed should be loosened out to favour its drying the sooner, as well as to facilitate the subsequent ginning; these when brought into the house should be spread on the lofts to dry.

The cotton wool in the lofts should be turned over every two or three days, or if the weather should not be windy it might be laid out to dry in the sun by spreading it on some of the ordinary country mats, or in the absence of such, if the ground is well swept and covered over with a thick mixture of cowdung which is generally used by the natives, it will answer very well.

Ginning or freeing the Cotton of Seeds.

I have no experience in any of the patent cotton cleaning machines. The Indian Churka is what I have used myself and seen used elsewhere. The cost of one I had constructed at Chingleputt was two rupees, and with this instrument a woman will clean from 30 to 40 pounds of seed cotton in a day of 10 hours, whereas she can only pick from 4 to 5 pounds with the hand during that time. I find no difficulty in cleaning any of the varieties of cotton with the Churka; when New Orleans or any other particular kind is used the only requisite is to see that the seeds are thoroughly dry, so as to crack between the teeth before being submitted to the Churka.

Some of the lately introduced cotton gins would no doubt be the best, but these should be of so simple a construction that any native blacksmith might be able to repair them when out of order; otherwise the natives will not bring it into general use.

The ginning should be carried out in a place protected from currents of wind. A good large room, well aired, would be the best, and the cotton that has been ginned should be placed on lofts erected for the purpose.

By having a good airy room for a store house the cotton wool will be preserved, and the fibres will dry thoroughly. If this be not attended to some portions of the cotton wool is apt to become discoloured.

Packing. With reference to packing the cotton, a screw press would no doubt be the best, and one of these should be introduced into every cotton district; or in the absence of such, the present mode of compressing the wool by the weight of a few coolies might be practised. But attention to cleanliness must be strictly adopted. The coolies should not be allowed to enter the store without having previously dusted their feet.

of 350 lbs each, and the weight of the bale should invariably be fixed at this rate : at present I believe the bale constitutes in Calcutta 300 lbs., in Madras 300 lbs., and in Bombay 392 lbs.

The bagging should well cover the bale, and the seams should be properly closed so that no part of the cotton be left exposed. The cotton will now be ready for export to the coast, and from thence to the English or other market to which it is intended to be sent.

In estimating the value of a cotton plantation, purely as a commercial speculation, it becomes necessary that the other products which it is capable of yielding should not be lost sight of.

With this object I shall now briefly consider the value of cotton seed, oil, fibre and wool.

Cotton seed. The seeds, from the Indian variety in particular, are largely used in India to feed cattle, more especially brought bullocks and milch cows, in quantities varying from 2 to 5 lbs. once a day. The seeds are merely steeped in water and placed before the animals.

In the foreign variety the seed, owing to the testa or covering of the seed being leathery, and when thoroughly dry becoming very hard, cattle refuse to eat it, and it does not possess the saccharine flavour of the Indian varieties; consequently cattle do not relish it at first, but when they become accustomed to its use they partake of it equally as well as of the indigenous varieties. But the Exotic seed requires to be bruised in either a grinding or pounding mill previous to being steeped in water. This plan should be invariably adopted with every variety of the foreign cotton seed when intended as fodder for cattle.

Oil. Cotton seed is known to produce oil. The process of extraction consists in first cleaning the seeds, and freeing them as much as possible of the wool and Fuzz that are still found adhering to them. They are then dried in the sun for

a couple of days ; afterwards pounded in a mill ; formed into cakes ; passed into canvass bags prepared for the purpose, and then submitted to the pressure of a powerful screw press.

The following are the results:—

20 lbs. of Brazil cotton seed produced 2 ounces of oil, which was of a very dark brown colour, neither acrid nor viscid, having a smell rather similar to the common lamp oil, with a slight oily taste. Specific gravity 0.9237. Half an ounce of this oil, with a cotton wick one inch long, weighing one grain, was burned in a wine-glass. It gave out a good bright yellow flame, but was slightly smoky, and continued to burn for 30 minutes. I believe that if the oil was clarified it would be entirely free of smoke, and it would make it as clear as the best Gingeelic oil.

10 lbs. of Bourbon cotton seed produced 2 ounces of oil, which was a shade lighter in colour, but in other respects the same as that of the Brazil ; specific gravity 0.9237 ; when burned in the quantity and way detailed above it lasted one hour. The smoke, if any, was scarcely perceptible, and the flame was bright and luminous.

10 lbs. of the New Orleans cotton seed produced 4 ounces of oil, which was of a light, brown colour, limpid, and clearer than either of the others ; specific gravity 0.9237, and when burned in exactly the same way as the other two kinds of oil, it lasted one hour and six minutes, giving a good bright flame and entirely free from smoke &c. Thus it will be seen that the oil, from the New Orleans cotton seed, is the best in every respect ; yielding double the quantity of oil to that produced by the Bourbon, and nearly six times as much as that of the Brazil.

It may be safely calculated that the produce of each of these oils might have been $\frac{1}{3}$ greater than the result obtained, which has been absorbed by the canvass bags ; but when expressed in large quantities the product would doubtless be much more abundant was the process to be tried on a more

extensive scale; whereas in the experiment with small quantities the pressure is not so great, and consequently much wastage occurs.

I am indebted to Messrs Gay and Co. of Madras, for carrying out these experiments for me at my expense.

I fully believe that oil of the kind described above, from either of the varieties of cotton seed, would bring from 250 to 300 Rs. the Ton in the English market. I find in the Juries Reports of the Madras Exhibition for 1855, that 8,090 hundred weights of Indian cotton seed oil was exported from Madras in 1852 and 53. In the Northern circles the average price of the seed, which is equivalent to 2 lbs., sells at $2\frac{1}{2}$ annas.

Medical Properties. The young shoots and pods of the cotton plants are used as Demulcents and Emollients. From their mucilaginous nature they are very soothing in their effects.

A Decoction of the plant is in great repute among the Natives as a fomentation in wounds and bruises. The wool has long been employed with good effect in surgical dressings, more especially in burns of the skin; the principal use being that of protecting the injured part from the irritation caused by the action of the air when it is applied in thin layers, one over the other, and retained by the application of bandages.

Cotton wool impregnated with nitre or chlorate of potash has been employed as a Moxa. Cotton cloth is well suited for clothing in an Indian climate from its preserving an uniformity of the temperature and readily absorbing moisture from the skin.

The oil, which is both nutrient and emollient, is extremely useful in frictions and Embrocations; its effects are great in softening and relaxing the skin, and it would make a capital application for the hair. It is also recommended for freckles.

Cotton fibre. The fibre of the cotton plant is prepared by gathering the plants, when cutting down has been practised on a plantation, after the fruiting season is over, and tying

them in proportionate sized bundles for steeping in water from 3 to 5 days; after which time, they should be taken out, untied, and each plant beaten on a piece of board with a wooden mallet, so as to loosen the bark from the wood; care should be taken that, whilst beating, the bark is not broken through, as that is likely to injure the fibres.

After being beaten the plants should again be put under water for another 3 or 5 days, according to circumstances, when the fibre will be found loose enough to be easily separated by the fingers. The fibres should then be gathered, washed in clean water, tied up into sheaves, and dried in the shade; but they should be placed out in the dew for a few nights to bleach or to improve the colour. The fibres are now found to be of a light brown colour, though this in a great measure will depend on the time the plant has been under water; as should it have been kept longer than was really necessary, the colour will have become dark brown and even approaching to blackness. The fibre would be extremely serviceable as cordage, and when prepared with care might with advantage be used for textile fabrics. Half an ounce of the fibres, twisted into a cord $\frac{1}{16}$ of an inch in thickness and 2 feet in length, bore a strain of 69 lb 2 oz ere it broke.

Dr. Royle gives the comparative strength of cotton fibre and coir as follows:—

Coir, 224

Cotton, 346

Cotton wood. From the experiments which have already been explained in another part of this Essay, it will be seen that a single plant produces 8 ounces and upwards of wood, according to its age. Although the wood never attains any very great size for useful or ornamental purposes, it is found to be tolerably tough and close grained, but very light. As common firewood it burns remarkably well. In an experiment conducted by me, I find that $\frac{1}{4}$ pound of the dried wood of the Brazil cotton was sufficient to raise 2 lbs. of water to boiling

point 212° F. and 1½ lbs. of wood was sufficient to cook 1 lb. of the ordinary rice with 3 lbs. of water, so as to fit it for food.

Oil cake. The cake obtained from the cotton seed is of a light brown colour, and contains large portions of the testa, or covering of the seed. It does not cake well, crumbling into powder by pressure of the fingers. It has an insipid, mawkish taste, and will make good fodder for cattle, or may be converted into excellent manure. For animals unaccustomed to its use it should be slightly sweetened for the first few days, after which it will be relished by them as food. I find that my milch Cows and Buffaloes require no coaxing, they greedily eat the oil cake from foreign seed when placed before them. As manure it is a first rate article; in some countries the cotton seed itself is used as such, but in this case it takes a long time for the seeds to rot and get incorporated with the soil. Whereas the oil cake is a better preparation, as it is better fitted to combine with the soil at once, supplying it to a great extent with a part of the organic matter that had been withdrawn from the soil by the cotton plant itself. I could not do better than give here the analysis of the oil cake which Dr. Royle gives in his work on cotton culture in India at page 157, said to be by Dr. Anderson, Chemist to the Highland Society.

Water	..	..	..	..	..	11.19
Oil..	..	..	..	..	..	9.08
Sugar	..	..	..	..	..	10.70
Albuminous compounds.						
(Nitrogen—3.95)	..	..	..	..	..	24.69
Ash..	..	..	..	..	..	5.64
The ash is said to contain,						
Silica,	..	..	..	..	..	1.32
Phosphates..	..	..	..	..	..	2.19
Excess of Phosphoric acid	..	..	..	..	..	0.15

Dr. Royle states that by comparing these results with those of the linseed cake, he finds that the cotton cake possesses very considerable nourishing or alimentary properties.

Appendix.

TO THE ACTING SECRETARY AGRICULTURAL AND HORTICULTURAL SOCIETY OF BENGAL.

DEAR SIR,—I have much pleasure in sending you the accompanying papers as supplemental to the Cotton Essay in which I have briefly detailed the produce of cotton per acre, also the state of my experimental plants up to the present time.

I also send copies of correspondence between myself, the Madras Chamber of Commerce, and the Manchester Cotton Supply Association, in which the quality and value of the cotton grown by me are given.

I regret much to state that Professor Mayer has not been able to complete the analysis for me, although he stipulated with me and undertook the analysis which he hoped to finish in a month or six weeks, but unforeseen events having taken up his time he has not been able to do so. I am sorry for this, however I sent duplicate samples to the Manchester Cotton Supply Association who have promised to try and get the analysis effected if possible. Here also accidental delay was occasioned, in consequence of an oversight on the part of the Conicapaly of the Honorary Agents (through whom I sent the soils &c. for transmission) not having forwarded the ashes and soils with the sample cottons in May last; but I believe they have since been forwarded, and it is possible an early analysis may be thus obtained.

The gentleman I wrote to on the subject of insects was Dr. Baird of the British Museum. Unfortunately that gentleman, in consequence of family bereavements, was long out of London, and only in June last I received a reply which was not satisfactory, nor did it contain the needed information.

Government have purchased the seeds offered them and have had them distributed.

I have since May last distributed nearly another hundred pounds of seed. Several natives have applied to me for seed and information, which I have freely given, and I am using my best efforts to encourage and extend the cultivation as much as possible.

I have also received several applications for seed and information on the subject of cotton from the Mysore country, with all of which I have readily complied.

In submitting the whole correspondence on the quality and value of cotton, I leave it to your Society to decide as to what portions of it should be published with the Essay as an Appendix, and how much of it should be omitted.

Dr. Hunter has furnished the drawing of the cotton plants, but having submitted them for the inspection of His excellency the Governor they have not been returned as yet; they are in the possession of Mr. Sim the Secretary to Government who is just now away on leave to the Neelgherries and will not return until the 2nd Instant. As soon as he returns Dr. Hunter promises to get the drawings and send them to me for transmission to you. The drawings have been elaborately finished and are the size of this pencil sketch, which I now submit, of the Religious cotton. They are very nicely colored and I hope will prove acceptable as an addition to the Essay. With reference to my letter of the 29 October 1862, should you think it would be safer to do so, please send the medal &c. awarded to me through the medium of the Madras Government.

I am Sir,

MADRAS:
6th October, 1862.

yours very truly,
JOHN SHORTT.

Supplemental to the Cotton Essay.

The Cotton Essay was closed on the 1st of April 1862, when, in consequence of all the varieties continuing in fruit, I was unable to determine the produce per acre. I am now desirous of continuing such information as I can give up to the present time, as also the results of the experiments, not confining himself to those detailed in the Essay, but going over the several plots. On taking a general average from these I find that the produce of the Brazil cotton as a garden culture was 185lbs of clean cotton wool per acre, and 130lbs as a field culture.

The produce of the Bourbon is much larger 215lbs as a garden culture and 170 as a field culture.

The produce of the New Orleans was 150 lbs as a garden and 100lbs as a field culture.

From this it will be observed that the Bourbon variety is the greatest producer, accounted for, in a great measure, by the plants continuing to produce throughout the year.

Although the Brazil appears the most hardy plant in some respects, yet it seems to suffer most from change of seasons and the ravages of insects.

The New Orleans stands next in its liability to suffer from atmospheric vicissitudes and the ravages of insects, and the Bourbon is the least affected by the causes that injure the other varieties.

Since February last I have given up irrigating the garden culture of the different varieties, and have done nothing beyond keeping them free from weeds &c. and although the monsoon failed and a severe drought was experienced in the station, nearly all the wells in the place having run dry and great scarcity of water being felt, the Brazil and Bourbon varieties continued to look extremely well and were covered with dark green foliage.

The Brazil ceased to fruit very early, but the Bourbon continued to do so, whilst the New Orleans, although looking dry and withered, continued to put forth occasional flowers and to ripen their fruit, the wool of which was short in staple and rather harsh.

Two full grown cocoanut trees in their immediate vicinity died in consequence of the drought, but none of the cotton plants seem to have suffered in this way; their evergreen and healthful appearance contrasted pleasantly with the dry and faded aspect of the various shrubs and trees around, and their dark green glossy foliage was quite refreshing to the eye in the midst of the surrounding aridity.

I took advantage of the first shower of rain that fell in the beginning of August and had the plants pruned. As the Brazil was the largest shrub and the plants were greater in number than the others, I divided them into three batches, the first I cut down to within one foot of the soil, the 2nd to within 3 feet, and the third I merely stopped their growth by pinching away their tops and removing

straggling branches. The Bourbon were covered with blossoms and fruit, so I merely stopped their growth and removed straggling branches.

The New Orleans I topped at the height of 2 feet from the soil and cut their branches around at about 6 inches from the main stem, and the earth around each variety was loosened, weeds exterminated, and they were dressed with rotten stable manure.

In the course of a fortnight the plants were quite bushy with shoots. The 3rd division of the Brazil that were stopped are shewing flower buds here and there.

The Bourbon are now ripening their fruit which is in course of being collected, whilst fresh flowers are appearing.

The New Orleans are loaded with flower and fruit.

It is possible that should the rains set in heavily some damage may be done, nevertheless I am in hopes of gathering in an early winter crop as I have made the plants as snug as possible.

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CHINGLEPUT.
October. 1862.

EXPLANATION OF ABBREVIATIONS USED IN THE COTTON ESSAY.

Part II Cotton yielding plants, under head *Gossypium Accuminatum*, the Invalid officer alluded to is Captain Templor of the Madras Invalids.

Under the head "Observations" wherever C comes means, "Chingleput."

Para no 3. The engineer officer alluded to is Lient. Hasted Asst. District Engineer, D. P. W. should be entered in a foot note.

Para no 5 Alludes to the garden of W. Domdeswell Esqre late Civil and Sessions judge Chingleput.

Para 7. Late Civil and Sessions Jndge means W. Domdeswell Esqre.

Gossypium Barbadosense.

Para 1 Where comes Mr. H—means Mr. Haydon a pensioned Drummer; The village alluded to is "Terupagooly" in the Taluk of Conjeveram, Chingliput District.

